REVIEW OF THE NATIONAL BUREAU OF STANDARDS ORGANIC ACT

HEARINGS

BEFORE THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

NINETY-SEVENTH CONGRESS

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[1] On assignment to Budget Committee for 97th Congress.

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REVIEW OF THE NATIONAL BUREAU OF STANDARDS ORGANIC ACT

TUESDAY, JUNE 16, 1981

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,
Washington, D.C.

The subcommittee met at 10:10 a.m., in room 2318, Rayburn House Office Building; Hon. Doug Walgren (chairman of the subcommittee) presiding.

Present: Representatives Walgren, Shamansky, Ertel, Heckler, and Gregg.

Also present: Representative Don Fuqua, chairman of the Science and Technology Committee.

Mr. WALGREN. I want to welcome the Secretary of Commerce this morning and the other witnesses who will appear in our review of the National Bureau of Standards, including the Director of the Bureau.

Today the subcommittee begins a review of the Organic Act of the National Bureau of Standards. The Bureau has been one of the most important science and technology agencies of our Government and certainly the lead agency in the Department of Commerce in that area.

The Bureau of Standards was established 80 years ago, in 1901, and over the years, it has established an enviable reputation for the integrity and high quality of its work in standards and engineering and in science.

Historically, during World War II, the Bureau made important contributions to our defense technology, most notably the proximity fuse was developed at the Bureau. And when President Roosevelt was urged by Albert Einstein to investigate the potential of uranium, he turned, first, to the Bureau's director, Dr. Lyman Briggs, for advice.

Today the Bureau is the lead agency for measurements and standards used throughout the Government and industry in such fields as materials, computers, and manufacturing processes. It also plays a significant role in the basic technology development in fields which are of high national importance, including building technology, energy inventions, materials science, automotive manufacturing, large-scale integrated circuits, and others.

The scope of the Bureau's present programs is therefore quite broad and substantial. And while it includes a dominant emphasis

on measurements and standards, it includes a significant area in development and research.

The Organic Act—the basic charter under which the Bureau operates was last reviewed and amended by the Congress in 1950. This was a time when the Bureau was refocusing its efforts after World War II, and the 1950 amendments properly placed its largest emphasis on standards and related work.

In today's environment, with a need for the United States to make a major effort in technology development, both in the Government and in the private sector, it is not clear that the Organic Act, as rewritten in 1950 for the Bureau, is entirely adequate to meet the needs and the proper focus for the Bureau for the future and even whether it is adequate to properly authorize the present scope of activities within the Bureau.

We have, therefore, concluded that it is certainly timely to take a careful look at the Organic Act under which the Bureau of Standards now functions. And without being committed to any specific changes in the act, we certainly want to explore whether or not we can make a constructive contribution to the present status of the Bureau and its future role.

I would emphasize that, in thinking about the future of the Bureau of Standards, we are looking down the road to the next 20 and 30 years. This means that, to some extent, we must look past the present problems and limitations which surround the current manpower and budget restrictions.

And we should ask the question: What should the Bureau be doing for the country in 5, 10, and 20 years from now? And what legislative authority would be most helpful in encouraging that accomplishment?

In preparation for these hearings our subcommittee commissioned well over a year ago two in-depth studies of the Bureau of Standards. One was done by the Congressional Research Service, the other by the General Accounting Office. Both are excellent studies and have been made available to the members and to the witnesses. We have also developed a draft bill, and I ask unanimous consent that the draft bill be printed at this point in the record.

[The bill draft and the prepared statement of Mr. Walgren follows:]

[COMMITTEE PRINT]

JUNE 9, 1981

97TH CONGRESS
1ST SESSION

H. R.

To amend the Act of March 3, 1901, establishing the National Bureau of Standards.

IN THE HOUSE OF REPRESENTATIVES

JUNE — , 1981

Mr. WALGREN introduced the following bill; which was referred to the Committee on

---

A BILL

To amend the Act of March 3, 1901, establishing the National Bureau of Standards.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE; AMENDMENTS MADE TO NATIONAL BUREAU OF STANDARDS ORGANIC ACT

SECTION 1. (a) This Act may be cited as the "National Bureau of Standards Amendments of 1981".

(b) Whenever in this Act an amendment is made to "the Act" or to any section or other provision thereof, such

amendment shall be considered to be made to the Act entitled "An Act to establish the National Bureau of Standards", approved March 3, 1901, as amended (15 U.S.C. 271 et seq.), or to the specified section or other provision of that Act.

BASIC MISSION AND FUNCTIONS

SEC. 2. Section 1 of the Act (15 U.S.C. 271) is amended by striking out the period after "Standards" and inserting in lieu thereof the following: "and shall have the following basic mission and functions:

"(1) enhancing the technological and scientific base of the Nation's industrial capability by contributing to the development of the basic technologies which underlie product and process development, technological innovation, and productivity;

"(2) the custody, maintenance, and development of the national standards of measurement and the provision of means and methods for making measurements consistent with those standards, including the comparison of standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the Government; and

"(3) contributing to the solution of national problems by developing and providing information to the

private sector and to other agencies and departments of the Federal and State governments.".

FUNCTIONS OF THE SECRETARY; HANDICAPPED TECHNOLOGY; LIFE SCIENCES RESEARCH

SEC. 3. Section 2 of the Act (15 U.S.C. 272) is amended—

(1) by striking out paragraph (a) and redesignating paragraphs (b), (c), (d), (e), and (f) as paragraphs (a), (b), (c), (d), and (e), respectively;

(2) by redesignating paragraphs (18) and (19) as paragraphs (20) and (21), respectively, and by inserting after paragraph (17) the following new paragraphs:

"(18) the development and provision of measurement technology and performance standards in building technology, fire safety, materials reliability and durability, product safety and performance, and computer-aided control and communication to insure the safe, efficient operation of devices and facilities for use by disabled persons;

"(19) research in the life sciences including the development of standards, testing procedures, and measurement instrumentation needed for the advancement of biotechnology, genetic engineering, and other fields of medicine and the life sciences;"; and

(3) by inserting "and biological" after "physical" in paragraph (20) (as so redesignated).

INTERNATIONAL COOPERATION

SEC. 4. Section 3 of the Act (15 U.S.C. 273) is amended by striking out "SEC. 3." and inserting in lieu thereof "SEC. 3B."; and the Act is further amended by inserting immediately before section 3B (as so redesignated) the following new section:

"SEC. 3A. The Bureau is authorized to engage in international cooperation, exchange, and other activities which advance the basic mission of the Bureau or which are in accord with the foreign policy objective of the United States. Such international activities may include technical cooperation and exchanges of information and personnel with science, technology, or standards organizations of other countries, and advice and support aiding the establishment or development of science, technology, or standards organizations of other countries. For this purpose the Bureau is authorized to use the funds appropriated for this purpose, funds made available through gifts or bequests, and excess foreign currencies made available through other Acts of Congress and/or treaties or agreements entered into by the United States.".

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ANNUAL REPORT; DEPUTY DIRECTOR

SEC. 5. Section 5 of the Act (15 U.S.C. 274) is amended—

(1) by inserting "(a)" before "The director";

(2) by striking out the third sentence and inserting in lieu thereof the following: "he shall make an annual report to the Secretary of Commerce and the Congress, including an abstract of the work done during the year, a breakdown of activities conducted by means of grants and contracts, and a financial statement."; and

(3) by adding at the end thereof the following new subsection:

"(b) A Deputy Director of the National Bureau of Standards shall be designated by the Director after consultation with the Secretary of Commerce."

MANDATED ACTIVITIES

SEC. 6. Section 7 of the Act (15 U.S.C. 275a) is amended by inserting "(a)" before "The Secretary" and by adding at the end theref the following subsection:

"(b) The Secretary shall charge for any service performed by the Bureau, at the request of another Government agency, in compliance with any statute enacted before, on, or after the enactment of this Act, which names the Secretary of Commerce, or the Director and/or the National Bureau of

Standards as a consultant to another Government agency, or calls upon the Secretary of the National Bureau of Standards to support or perform any activity for or on behalf of another Government agency in the performance by that agency of any activity, regardless of whether the statute specifically requires reimbursement to the Secretary, the Director, or the National Bureau of Standards by such other Government agency for such service, unless funds are specifically appropriated to the Secretary, the Director, or the National Bureau of Standards to perform such service. The Director may, however, waive any charge where the service rendered by the Brueau is such that the National Bureau of Standards will incur only nominal costs in performing it.".

PROCUREMENT

SEC. 7. Section 8 of the Act (15 U.S.C. 276) is amended—

(1) by inserting "(c)" before "In the absence"; and

(2) by inserting the following immediately before subsection (c) (as so designated):

"(a) In the conduct of its programs, the Bureau is authorized to establish research and development laboratories, and to acquire land, construct buildings, and purchase equipment and facilities; to procure equipment and services through contracts; and to award grants for the conduct of

research and development to individuals, colleges and universities, and other organizations.

"(b) The Bureau shall employ grants and contracts for the conduct of research and development when it serves to increase efficiency, when it can take advantage of special capabilities available elsewhere, when it can assist in establishing desired capabilities outside Government, and when it serves to enchance the Bureau's own capabilities through increased professional contacts, or otherwise.".

VISITING COMMITTEE

SEC. 8. Section 10 of the Act (15 U.S.C. 278) is amended to read as follows:

"SEC. 10. (a) There shall be a visiting committee of nine members to be appointed by the Secretary of Commerce, to consist of persons prominent in the various areas of responsibility of the Bureau under this Act, and not in the employ of the Government. Three shall be experts in scientific research or its administation, three shall be knowledgeable of industrial manufacturing or its management, and three shall be experienced in the use of standards and measurement.

"(b) The visiting committee shall visit the Bureau at least once a year, shall review such aspects of the Bureau's work as it deems in need of review, and shall report to the

Secretary of Commerce annually upon its findings and recommendations, if any.

"(c) The members of the visiting committee shall serve without compensation, but shall be paid the actual expenses incurred in attending its meetings.

"(d) Appointments to the visiting committe shall be for a period of five years, and the period of service of the members shall be so arranged that two members shall retire each year. The committee shall elect its own chairperson.

"(e) Appointments to fill vacancies occurring other than in the regular manner are to be made for the remainder of the period in which the vacancy exists.

"(f) The director is authorized, on the request of the chairperson, to assign no more than two members of the Bureau's professional staff at any one time to work in support of the visiting committee's work.".

JOINT INSTITUTES AND CENTERS

SEC. 9. The Act is amended by inserting after section 10 the following new section:

"SEC. 11. (a) The Bureau is authorized to establish Joint University Research Institutes to conduct research focused on a single subject area selected by the Director to advance the basic mission of the Bureau. Such joint Institutes may be located on or adjacent to a university campus. For this purpose the Director is authorized to enter into

memoranda of understanding with a university covering the goals of the Institute, the terms under which the research is to be performed and the research results disseminated, the staff and funding arrangements and such other aspects as the two parties deem relevant to the furthering of the goals of each Joint Institute.

"(b) The Bureau is authorized to establish Joint Technology Development Centers to conduct research and development focused on a single subject area selected by the Director to advance the basic mission of the Bureau. Such Joint Centers may be established in cooperation with nonprofit trade or professional organization, industrial firms, or institutions of higher learning and may be located in any State. For this purpose the Director is authorized to enter into memoranda of understanding with the selected organizations covering the goals of the Center, the research and development to be performed and the results utilized, the staff and funding arrangements, and such other aspects as the two parties deem relevant to the furthering of the goals of each Joint Center."

SCIENCE AND ENGINEERING GRADUATE FELLOWSHIPS

SEC. 10. The second paragraph under the headings "BUREAU OF STANDARDS" (DEPARTMENT OF COMMERCE.) in the Act of July 16, 1914 (15 U.S.C. 280), is amended to read as follows:

"The Bureau is authorized to award, within the limits of funds made available specifically for this purpose, fellowships for graduate study in the physical, mathematical, and biological sciences and in engineering at American, degree-granting institutions of higher learning selected by the recipient of such aid, for stated periods of time. Persons shall be selected for such fellowships from among citizens of the United States, and such selection shall be made solely on the basis of ability."

MISCELLANEOUS REPEALS

SEC. 11. The following are repealed:

(1) The last paragraph under the heading "CONTINGENT AND MISCELLANEOUS EXPENSES." in the Act of March 4, 1913, as amended (15 U.S.C. 281).

(2) The Act of May 14, 1930 (15 U.S.C. 282).

OPENING STATEMENT OF

HON. DOUG WALGREN, CHAIRMAN

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

COMMITTEE ON SCIENCE AND TECHNOLOGY

JUNE 16, 1981

TODAY OUR SUBCOMMITTEE BEGINS A REVIEW OF THE ORGANIC ACT OF THE NATIONAL BUREAU OF STANDARDS, ONE OF THE IMPORTANT SCIENCE AND TECHNOLOGY AGENCIES OF THE DEPARTMENT OF COMMERCE.

THE BUREAU OF STANDARDS WAS ESTABLISHED 80 YEARS AGO, IN 1901. OVER THE YEARS, IT HAS ESTABLISHED AN ENVIABLE REPUTATION FOR THE INTEGRITY AND HIGH QUALITY OF ITS WORK IN STANDARDS, IN ENGINEERING, AND IN SCIENCE.

DURING WORLD WAR II, THE BUREAU MADE IMPORTANT CONTRIBUTIONS TO OUR DEFENSE TECHNOLOGY. MOST NOTABLY, THE PROXIMITY FUZE WAS DEVELOPED AT THE BUREAU. WHEN PRESIDENT FRANKLIN ROOSEVELT WAS URGED BY ALBERT EINSTEIN TO INVESTIGATE THE POTENTIAL OF URANIUM, HE TURNED FIRST TO THE BUREAU'S DIRECTOR, DR. LYMAN BRIGGS FOR ADVICE.

TODAY THE BUREAU IS THE LEAD AGENCY FOR MEASUREMENTS AND STANDARDS USED THROUGHOUT GOVERNMENT AND INDUSTRY IN SUCH FIELDS AS MATERIALS, COMPUTERS, AND MANUFACTURING PROCESSES. IT ALSO PLAYS A SIGNIFICANT ROLE IN BASIC TECHNOLOGY DEVELOPMENT IN FIELDS WHICH ARE OF HIGH NATIONAL IMPORTANCE. THESE INCLUDE BUILDING TECHNOLOGY, ENERGY INVENTIONS, MATERIALS, AUTOMATED MANUFACTURING, VERY LARGE SCALE INTEGRATED CIRCUITS, AND OTHERS.

THE SCOPE OF THE BUREAU'S PRESENT PROGRAMS IS THUS SUBSTANTIAL. WHILE IT INCLUDES A DOMINANT EMPHASIS ON MEASUREMENTS AND STANDARDS, IT INCLUDES MUCH OTHER SIGNIFICANT WORK IN DEVELOPMENT AND RESEARCH.

83-040 O—81——2

THE ORGANIC ACT WAS LAST REVIEWED AND AMENDED BY THE CONGRESS IN 1950. THIS WAS A TIME WHEN THE BUREAU WAS REFOCUSING ON ITS PEACE-TIME MISSION, AND THE 1950 AMENDMENTS PROPERLY PLACED THE EMPHASIS ON THE STANDARDS WORK.

IN TODAY'S ENVIRONMENT, WITH THE NEED FOR THE UNITED STATES TO MAKE A MAJOR EFFORT IN TECHNOLOGY, BOTH IN THE GOVERNMENT AND IN THE PRIVATE SECTOR, IT IS NOT CLEAR, HOWEVER, THAT THE ORGANIC ACT FOR THE BUREAU IS ENTIRELY ADEQUATE TO MEET THE NEEDS AND CHALLENGES OF THE FUTURE, OR EVEN TO PROPERLY AUTHORIZE THE PRESENT ACTIVITIES OF THE BUREAU.

WE HAVE, THEREFORE, CONCLUDED THAT IT IS TIMELY TO TAKE A CAREFUL LOOK AT THE ORGANIC ACT UNDER WHICH NBS NOW FUNCTIONS. WITHOUT BEING COMMITTED AT THIS POINT IN TIME TO ANY SPECIFIC CHANGES TO THE ACT, WE WANT TO EXPLORE WHETHER WE CAN MAKE A CONSTRUCTIVE CONTRIBUTION TO THE PRESENT AND FUTURE WORK OF THE BUREAU.

I WOULD EMPHASIZE THAT IN THINKING ABOUT THE FUTURE OF THE NATIONAL BUREAU OF STANDARDS, WE ARE LOOKING DOWN THE ROAD TO THE NEXT 20 TO 30 YEARS. THIS MEANS THAT, TO SOME EXTENT, WE MUST LOOK PAST THE PRESENT PROBLEMS AND LIMITATIONS WHICH SURROUND THE CURRENT MANPOWER AND BUDGET RESTRICTIONS AND THE PROBLEMS WHICH THEY HAVE BROUGHT ABOUT. WE MUST ASK: "WHAT SHOULD THE BUREAU BE DOING FOR THE COUNTRY 5, 10, AND 20 YEARS FROM NOW, AND WHAT LEGISLATIVE AUTHORITY IS NEEDED FOR THAT PURPOSE?"

WE ARE GLAD TO WELCOME AS OUR OPENING WITNESS THE SECRETARY OF COMMERCE, THE HONORABLE MALCOLM BALDRIDGE. SECRETARY BALDRIDGE HAS TAKEN THE LEAD IN RETHINKING AND REDEFINING MANY OF THE FUNCTIONS OF THE GREAT DEPARTMENT WHICH HE HEADS, AND WE WELCOME HIM TO OUR COMMITTEE.

We are glad to welcome, as our opening witness, the Secretary of Commerce, the Honorable Malcom Baldrige.

Secretary Baldrige has taken the lead in rethinking and redefining many of the functions of the Department of Commerce, which he heads, and we welcome him to our committee.

And before turning to you, Mr. Secretary, I would like to turn to the chairman of the full Committee on Science and Technology, Don Fuqua.

Mr. FUQUA. Thank you very much, Mr. Chairman.

Let me join you in welcoming the Secretary of Commerce, and the Director of the National Bureau of Standards, who has had many appearances here. Also, while he is not testifying, I would like to welcome back Paul Vander Myde who worked diligently and loyally on this committee for a number of years. We are happy to have Paul back.

I think the Bureau of Standards is one of the finest Federal agencies that we have. It certainly makes a great contribution to many of the things that we're looking for now, such as more productivity and innovation.

I also think it is fitting that we review the Organic Act of the Bureau of Standards to see if changes should be made as to where the role of the Bureau fits in with our overall national purposes and policies.

I think these are going to be very meaningful hearings, and we appreciate very much that you have taken the time to be here. It certainly shows your interest in the value of the National Bureau of Standards and the work that they do in behalf of our national interests.

So, we are happy to welcome you here and also to welcome back Dr. Ambler. Thank you.

Mr. WALGREN. Thank you, Mr. Chairman. The Chair would like to recognize the ranking minority member of the subcommittee, Margaret Heckler.

Mrs. HECKLER. I would like to welcome Secretary Baldrige and Dr. Ambler, who has always worked very faithfully with this committee and with Congress in trying to find a way to improve our productivity as a nation. And I would like to make a formal statement for the record.

Mr. WALGREN. Without objection, that will be included at this point in the record.

[The prepared statement of Mrs. Heckler follows:]

OPENING REMARKS

HONORABLE MARGARET M. HECKLER

HEARING ON THE REVIEW OF THE NATIONAL BUREAU OF STANDARD'S ORGANIC ACT

JUNE 16, 1981

THANK YOU MR. CHAIRMAN.

IT IS BOTH A PLEASURE AND AN HONOR TO HAVE THE SECRETARY OF COMMERCE, MALCOLM BALDRIDGE, HERE WITH US THIS MORNING. HIS APPEARANCE BEFORE US TODAY, I UNDERSTAND, IS INDICATIVE OF HIS INTEREST IN NBS AND THE NEW ROLE IT WILL PLAY WITHIN THE DEPARTMENT OF COMMERCE.

IT IS ALSO A GREAT PLEASURE TO HAVE DR. ERNEST AMBLER, THE DIRECTOR OF NBS, WITH US TODAY. THOUGH I AM SOMEWHAT DISAPPOINTED THAT HE WILL NOT BE PROVIDING HIS OWN TESTIMONY, I AM PLEASED THAT HE WILL BE AVAILABLE TO ANSWER ANY QUESTIONS WE MIGHT HAVE.

IT MIGHT BE EASY TO OVERLOOK THE IMPORTANCE OF THE NATIONAL BUREAU OF STANDARDS. IT HAS, AFTER ALL, BEEN AROUND SINCE THE TURN OF THE CENTURY, AND HAS THE DISTINCTION OF BEING THE OLDEST FEDERAL LABORATORY IN THE NATION. BUT THIS WOULD BE AN ENORMOUS MISTAKE.

THE MAJOR ISSUE BEFORE CONGRESS IS HOW TO GET OUR COUNTRY GOING AGAIN. TO SLOW INFLATION, CUT GOVERNMENT SPENDING, AND TO INCREASE INDUSTRIAL INNOVATION AND

PRODUCTIVITY. TO ACCOMPLISH THIS, AMERICAN INDUSTRY WILL REQUIRE BASIC MEASUREMENTS ALONG WITH STANDARDS FOR QUALITY CONTROL IF THEY ARE TO PRODUCE A BETTER PRODUCT.

IN A SOCIETY OF RAPID CHANGE, BE IT SOCIAL OR ECONOMIC, AND INCREASING COMPLEXITY, THERE IS AN EVEN GREATER NEED FOR STANDARDS. THERE IS A VITAL NEED FOR NBS SERVICES, BE THEY COMPUTER STANDARDS, CALIBRATION METHODS, IMPROVEMENTS IN THE PERFORMANCE AND FIRE SAFETY OF BUILDINGS, ENERGY EFFICIENCY, AUTOMATION, OR CHEMICAL PROCESSING. THE LIST GOES ON -- INFACT -- MAYBE TOO LONG.

ONE OF THE ISSUES WE WILL BE EXPLORING IN THESE THREE DAYS OF HEARINGS IS THAT OF THE NATIONAL BUREAU OF STANDARDS' BROAD AGENDA OF PROGRAM AREAS. IT SEEMS THE BREADTH OF THE AGENDA MAY BE CAUSING AN "INNOVATION AND PRODUCTIVITY" CRISIS WITH THE BUREAU ITSELF. IT HAS BEEN SUGGESTED THAT OUR SUBCOMMITTEE EXAMINE THE NBS ORGANIC ACT IN LIGHT OF THESE PROBLEMS TO DETERMINE WHETHER OR NOT SOME CHANGES COULD BE MADE TO IMPROVE THE OPERATIONS OF THE BUREAU.

I HAVE NO PRECONCEIVED NOTIONS OF HOW BEST TO DO THIS, THOUGH I AM CERTAIN THAT SOME CHANGES ARE IN ORDER. IT IS IN THE HOPE OF ARRIVING AT SOME SOLUTIONS THAT I LOOK FORWARD TO TODAY'S TESTIMONY.

Mr. WALGREN. We're happy to have you, Mr. Baldrige, and we welcome your statement.

[The biographical sketches of Messrs. Baldrige and Ambler follow:]

BIOGRAPHY
MALCOLM BALDRIGE
26TH SECRETARY OF COMMERCE

Malcolm Baldrige was nominated to be Secretary of Commerce by President Ronald Reagan December 11, 1980. He was confirmed by the United States Senate on January 22, 1981 and sworn in to office on January 23, 1981.

Mr. Baldrige had been chairman and chief executive officer of Scovill Inc., Waterbury, Connecticut, which operates 81 manufacturing plants in the United States and in 22 other countries around the world. International sales in 1979 accounted for almost one-third of the company's profits.

Having served in the infantry in World War II, Mr. Baldrige began his career in the manufacturing industry in 1947 as a mill hand at the Eastern Malleable Iron Company in Naugatuck, Connecticut, rising to president of the company by 1960.

Mr. Baldrige joined Scovill in 1962 as executive vice president. He is credited with leading the transformation of Scovill from a financially troubled brass mill to a highly diversified international manufacturer of consumer, housing and industrial goods.

On the rodeo circuit, Mr. Baldrige has won many awards as a professional steer roper. He worked during his boyhood as a ranch hand in western Nebraska.

A highly successful businessman prominent in community affairs, Mr. Baldrige has served on the boards of directors of the Bendix Corporation; ASARCO; Uniroyal; AMF; and the Connecticut Mutual Life Insurance Company. He is a trustee of the Swiss Reinsurance Company. He is a member of the Business Council, the Council on Foreign Relations, Inc., and the International Chamber of Commerce.

Mr. Baldrige was active in many community organizations in Waterbury including the Easter Seal Society of which he was incorporator, the Red Cross, YMCA, and the Chamber of Commerce, which he headed.

In 1979, Mr. Baldrige was chairman of the Connecticut Bush for President Committee, and the following year he was co-chairman of the Connecticut Reagan-Bush for President Committee. Also in 1980 he was national vice chairman of the Business for Reagan-Bush Committee.

Mr. Baldrige was born on October 4, 1922 in Omaha, Nebraska. He attended the Hotchkiss School and graduated from Yale University with a bachelor's degree in 1944. He is married to the former Margaret Trowbridge Murray. They have two children.

January 1981

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D. C. 20234

Ernest Ambler, Director

Dr. Ernest Ambler became the 8th Director of the National Bureau of Standards in February, 1978.

As Director of NBS Dr. Ambler leads the nation's central reference laboratory. NBS provides measurement methods, standards, and data that are used in industry, commerce, government and universities. NBS also applies its technical resources in helping solve problems of broad national importance. The Bureau's headquarters are located at Gaithersburg, Md., with a second laboratory at Boulder, Colo. Total staff numbers about 3500, over half working in scientific and technical areas.

Dr. Ambler joined NBS in 1953, and has worked throughout his career to make NBS an increasingly valuable scientific and technical resource for industry, business, Government, education, and the public. As a scientist, he has contributed directly to the state-of-the-art in measurement technology. His expertise in nuclear physics and cryogenics formed the basis in 1956 for a cooperative effort that disproved the law of parity conservation, a concept that nuclear scientists had adhered to for more than 30 years. This pioneering project confirmed experimentally the theoretical work of Nobel Prize winners T. D. Lee and C. N. Yang.

As an administrator, Dr. Ambler has helped guide Bureau operations and policies to improve the efficiency with which NBS fulfills its mission. His management responsibilities began in 1961 when he became Chief of the Cryogenic Physics Section. Four years later, he was appointed Chief of the Inorganic Materials Division. In 1968, as Director of the Institute for Basic Standards, he assumed responsibility for directing the most basic of NBS research activities: developing and maintaining standard and measurement techniques for such quantities as length, mass, time and frequency, and temperature.

In 1973 he was appointed Deputy Director, and Acting Director in 1975.

Among Dr. Ambler's continuing concerns is the Bureau's role in international science. He has long acknowledged that through its mission and diversity, the Bureau can act as a prime agent in international scientific cooperation and can support U.S. foreign commerce through participation in international standardization activities. In 1972, Dr. Ambler was elected to serve as the U.S. representative to the International Committee of Weights and Measures (CIPM), the executive body of the General Conference of Weights and Measures. In addition, he serves as chairman of the Consultative Committee on Standards for Measuring Ionizing Radiations of the CIPM.

Dr. Ambler is a member of the American Association for the Advancement of Science, the American Physical Society, and as Director of NBS is, ex officio, President of the National Conference on Weights and Measures.

Dr. Ambler is the recipient of numerous honors, awards, and fellowships including: The Department of Commerce Gold Medal, the NBS Stratton Award, Nuffield Fellow of Oxford University, the John Simon Guggenheim Memorial Foundation Fellowship Award, the John Price Wetherill Medal of the Franklin Institute, the Washington Academy of Sciences Award, the Arthur S. Flemming Award, the William A. Wildhack Award, and the President's Award for Distinguished Federal Civilian Service. He has authored 51 publications and holds a patent for low temperature refrigeration apparatus and processes.

Born in Bradford, Yorkshire, England, in 1923, Dr. Ambler earned his B.A., M.A., and Ph.D. in physics at Oxford University before coming to the National Bureau of Standards. He became a United States citizen in 1958. Dr. Ambler and his wife, Alice Seiler Ambler, a former staff member in the NBS Heat and Building Research Divisions, were married in 1955. They live in Bethesda, Maryland, with their two sons, Christopher and Jonathan.

December 1978

STATEMENT OF HON. MALCOLM BALDRIGE, SECRETARY, DEPARTMENT OF COMMERCE; ACCOMPANIED BY DR. ERNEST AMBLER, DIRECTOR, NATIONAL BUREAU OF STANDARDS, AND RAYMOND KAMMER, JR., DEPUTY DIRECTOR, NATIONAL BUREAU OF STANDARDS

Secretary BALDRIGE. Thank you, Mr. Chairman.

I am happy to take part in these hearings on the Organic Act of the National Bureau of Standards.

That act established the Bureau as our central laboratory for developing national standards of measurement, determining the physical properties of materials, and developing testing methods. It has allowed the Bureau to work on a wide range of problems and has encouraged it to develop close relationships with all elements of the public and private sectors. While it is important that we examine the Organic Act to make sure that it meets our current needs, I am not recommending any major changes to it at this time.

I am presently considering ways to make the Department of Commerce more useful in helping improve the productivity of our industry and the competitiveness of our exports. The National Bureau of Standards will figure prominently in these plans, I assure you.

As these developments unfold and their effects are evaluated, we will be in a better position to determine whether the Organic Act needs to be revised, and if so, how to change it.

Let me get specific, please. The Department has assumed new and important responsibilities for promoting the export of U.S. goods and services. If our International Trade Administration is to do its job properly, it must have a clear understanding of how American product standards differ from those of our competitors and our potential customers. To be able to effectively promote our products abroad, the International Trade Administration must understand our own technological strengths and weaknesses.

I believe NBS can provide our International Trade Administration with most of the help it needs in these matters. But presently, NBS and ITA do not have enough contact with each other. By having them work together more closely, ITA will have the resources it needs to perform its responsibilities, and NBS will gain a clearer understanding of the concerns and priorities of American industry. That understanding will help NBS direct or redirect its programs accordingly.

Similarly, the Department's present way of making economic assessments and analyzing the state of our industrial sectors needs review. I am not sure our present structure takes full advantage of the Bureau's capability for evaluating technological factors. If we do not get all we can out of NBS, the quality of our work will not be as good as it could be.

To guard against this, I have submitted legislation to Congress to create a new position of Under Secretary for Economic Affairs, who will bring our various economic components together.

I will expect the Bureau to work closely with our economic and policy analysts, and I expect it to gain considerable insight from this relationship for developing its own programs and setting its own priorities.

I am considering having the Bureau's Director report directly to me and not through any intermediate layers of management. This could help assure that NBS contributes more fully to our decision-making and, in return, gain valuable information on how we can contribute to our goal of helping American industry increase its productivity.

It would be a mistake, in my opinion, to alter the mission of the Bureau or otherwise affect its operations by legislation until we have seen what develops from this new relationship I have been talking about to the rest of the Department of Commerce.

The NBS Organic Act, as it presently exists, has been sufficiently flexible to permit NBS to strike a balance between its original mission and the needs of emerging technologies, such as automation, very large-scale integrated circuits, and metals processing.

It allows NBS to address industry-specific needs, such as construction, electronics, and polymers, and broad areas that underlie many industrial sectors, such as chemical or physical data and calibrations.

I recommend, therefore, that you defer considering redrafting the NBS Organic Act until the next session of this Congress. At that time, we will be in a better position to make any recommendations that will enable NBS to function more effectively in our organization.

Although I can't support legislation at this time, I have, as you requested, reviewed the subcommittee's draft bill. I am not prepared to provide detailed, section-by-section comments on all sections of the draft, but I do have some preliminary views, as you requested.

Section 2 would amend the Organic Act so that it sets forth the three basic roles of the Bureau implicit in the functions the Organic Act and other related laws authorize me to undertake. I think the three roles are an accurate and appropriate reflection of the Bureau's mission.

In my mind, the most important of these roles and the one which I would suggest be listed first, is the custody, maintenance, and development of our national standards of measurement and related functions. This is the foremost mission of the NBS and one that it has well provided the Nation since the Bureau's creation in 1901.

Section 3 reflects well on this Subcommittee's ability to foresee the future. I recognize that biotechnology is becoming an important industrial discipline. NBS is already beginning to monitor measurement-related research in this area, under the authority of the existing act and explicit recognition of our authority to do so in this important area is welcome. However, we believe the section goes too far, by authorizing us to perform research into medicine and the life sciences. We have no expertise in these matters, and it would be wasteful for us to develop it in view of the superb work already being performed by the National Institutes of Health and other fine institutions.

Section 6 would amend the Organic Act to clarify that when a law requires us to perform a service for another agency we only have to do it if the other agency agrees to pay or if Congress appropriates funds. This is how we conduct our operations now, and an explicit clarification would be welcome.

There are, however, a number of features which I believe need further study and which I could not endorse at this time.

First, I don't think it would be wise to pressure NBS into entering into joint research or joint technology development center arrangements. The act already provides us with implicit authority to do so. And I fear that amending the act to provide the specific authority will lead to undue pressure on the Bureau to use this approach, which may not always be the best one.

Second, I don't think it is wise to specify a list of criteria which, if present, would compel NBS to contract out. NBS already has the authority to use research grants and contracts and is actively seeking ways to increase their use. I don't believe the bill gives NBS enough flexibility to consider other important factors, such as the need for objectivity or the loss of capacity to perform in-house research. This can occur if we replace scientists with grant or contract administrators.

Third, I do not believe that NBS should be given the authority to award fellowships for graduate studies at colleges and universities in science and engineering. This is not really a proper function for an agency that is essentially a research lab with specific programs.

In short, Mr. Chairman, while some of the provisions in the discussion bill provide useful clarification of the Bureau's authorities and responsibilities, I am concerned that others may be inconsistent with its basic function as a research laboratory.

Dr. Ambler and I will be pleased to respond to your questions.

I might say, Mr. Chairman, that with regard to my last thought about the possible inconsistency with the basic function of the NBS as a research laboratory, I view it, as I am sure you do, as one of the best in the world, and that is why we want to keep that function predominant.

Thank you, sir.

[The prepared statement of Mr. Baldrige follows:]

STATEMENT OF

MALCOLM BALDRIGE, SECRETARY

DEPARTMENT OF COMMERCE

BEFORE THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

JUNE 16, 1981

Mr. Chairman and Members of the Subcommittee:

I am pleased to take part in these important hearings on the Organic Act of the National Bureau of Standards. That Act established the Bureau as our central laboratory for developing national standards of measurement, determining the physical properties of materials, and developing testing methods. It has allowed the Bureau to work on a wide range of problems and has encouraged it to develop close relationships with all elements of the public and private sectors.

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As these developments unfold and their effects are evaluated, we will be in a better position to determine whether the Organic Act needs to be revised and if so, how to change it.

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To guard against this, I have submitted legislation to Congress to create a new position of Under Secretary for Economic Affairs who will bring our various economic components together. I will expect the Bureau to work closely with our economic and policy analysts and I expect it to gain considerable insight from this relationship for developing its own programs and setting its own priorities.

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The NBS Organic Act, as presently drafted, has been sufficiently flexible to permit NBS to strike a balance between its original mission and the needs of emerging technologies, such as automation, very large scale integrated circuits and metals processing. It allows NBS to address industry-specific needs such as construction, electronics, and polymers, or broad areas that underlie many industrial sectors, such as chemical or physical data and calibrations.

I recommend, therefore, that we defer considering redrafting the NBS Organic Act until the next session of this Congress. At that time, we will be in a better position to make any recommendations to enable NBS to function more effectively in our organization.

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In short, Mr. Chairman, while some of the provisions in the discussion bill provide useful clarification of the Bureau's authorities and responsibilities, I am concerned that others may be inconsistent with its basic function as a research laboratory.

Dr. Ambler and I will be pleased to respond to your questions.

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Mr. WALGREN. Thank you very much, Mr. Secretary.

At this point, Dr. Ambler has, as I understand it, no formal submission, but will stay and answer questions. The Chair would recognize other members in order of appearance. Mr. Shamansky?

Mr. SHAMANSKY. Thank you, Mr. Chairman.

Mr. Secretary, I'm a little concerned about the idea that we must continue to wait after 30 years. I realize you have an immediate responsibility, but since it has been 30 years since we have examined the Bureau's charter, it seems to me that it is an inappropriate time to begin the serious business of examining the Bureau's future role, instead of deferring it once again.

Secretary BALDRIGE. I have to say, sir, that it goes against my grain a little too, because I am not used to operating that way in general. I think the best way to answer your question is to make the following statement and then show what bothers me about jumping into this too quickly, from my point of view. We're involved in wrestling with the problem of what is the appropriate role of the U.S. Government in helping to increase the productivity and competitiveness of U.S. industry.

In the Department of Commerce I am considering, as I mentioned, having the Director of the National Bureau of Standards and also the Commissioner of Patents and Trademarks report directly to me rather than to an Assistant Secretary. Further, I am considering putting the National Technical Information Service and the Office of Product Standards Policy, which have been under the Department's Assistant Secretary for Productivity, Technology and Innovation, into NBS. Thus they would become part of NBS and be under the jurisdiction of the Bureau's Director. I have already consolidated the economic policy analysis and data gathering functions of the Department under an Assistant Secretary of Economic Affairs and have submitted legislation to the Congress to upgrade and replace that Assistant Secretary with an Under Secretary for Economic Affairs. I am considering having our Bureau of the Census, our Bureau of Economic Analysis, and our Chief Economist, involving all the parts that go along with that position, report to that Under Secretary. I am also considering having an Assistant Secretary for Business Affairs also report to the Under Secretary. Under that Assistant Secretary we're considering setting up an Office of Competitive Assessment to investigate how we stand, industry by industry, on a worldwide competitive basis and try and project for the future. Our Bureau of Industrial Economics and a new Office of Productivity and Technology would also report to that Assistant Secretary.

We haven't done all of it yet. I think all of those are good ideas. I will probably recommend that we reorganize the Department that way, and I hope we get approval for it.

Out of that will come what I think are some major new roles for the NBS that aren't clear yet. I would like to be able to say today, I had a very clear-cut idea of what the U.S. Government and the Department of Commerce could do to aid American productivity and competitiveness worldwide. As you know, sir, that is a combination of 1,000 different factors. It is not just one major grand idea. If we push hard enough, we can make it work.

It is a very complicated series of things to make our industry effective again. We have to zero in on and define exactly what the U.S. Government should do. Previous efforts to do so have given us only fuzzy answers. Industry does not understand enough to come up with the right answer and neither do we. We are caught in a dichotomy of believing in a free enterprise, free trade system, while some of our trading competitors around the world believe in government subsidies to push their growing, emerging industries. If we want to be world leaders we will have to find the right answer. No matter what the answers, the National Bureau of Standards will be an integral part of it. I'm just not smart enough to know what the specific answer is now.

Mr. SHAMANSKY. Mr. Secretary, I must submit for your consideration this one Congressman's view, that regardless of what grand plan you evolve for the future of the whole Government, certain activities of the National Bureau of Standards will remain, regardless, and would under any circumstance. It seems to me it is an appropriate time now to examine those activities, which would in no way detract from the grand design you are talking about.

Thank you, Mr. Secretary.

Mr. Chairman, thank you.

Mr. WALGREN. Thank you, Mr Shamansky. Mrs. Heckler.

Mrs. HECKLER. Thank you, Mr. Chairman.

Secretary Baldrige, I consider reorganization extremely desirable. I personally think there is tremendous need for an Office of Competitive Assessment, because the issue emerges in all conversations concerning trade. It seems incredible to me that our Government has not assessed the competition it supports, its tax advantages and subsidies, and our own ability to match in our marketplace what our exports face abroad. Have we been doing anything thus far in this regard?

Secretary BALDRIGE. I think the best answer to that is on a formal basis, we haven't. We've done and have done for sometime, industrial analysis by sectors in the Department of Commerce, but it's been mostly based on the state of the domestic industry. Exports, the reason for the strength of exports, the technological lag, why we were on the short end—have not been investigated as a matter of course.

Occasionally, for specific industries such as the automobile industry, the steel industry, the textile industry, the International Trade Administration would take the lead on handling what happens abroad, and how it affects the U.S. industry. And we have been able to do a good job, and that is done. But we haven't had this organized methodical way, industry by industry, of trying to look ahead into the future.

And I think it is an absolute must, because that's the way we should develop national policies, understand the trends, 10, 20 years from now, not just look behind us and see a Chrysler situation happening or something like that.

Mrs. HECKLER. Mr. Secretary, I presume that this new office would then take into account tax policies and Government subsidies. You did make reference to that in your statement. Would that be part of their function?

Secretary BALDRIGE. Well, the function would be to just explain or show, analyze the present state of whatever the U.S. industry sector was. All of the factors that bear on the present state and what would happen in the future. And when you say "competitive assessment," it means comparing them, obviously, with their competitors from abroad. That would mean showing the subsidies that a Japanese or French company might have in the same business, the tax structure, the marketplace, all of the things of current competition.

It would try and show all of those, and what would be liable to be the trend of those in the future, and how that would affect the U.S. industry.

Mrs. HECKLER. It is reminiscent in my mind to the proposals for planning, the laxity onus, which nevertheless has some advantages of looking ahead.

Secretary BALDRIGE. No, ma'am. It doesn't mean to suggest that we would in any way come up with an idea for subsidies to counter their subsidies. It is more of a way to negotiate out their kinds of subsidies that are unfair to our business.

Mrs. HECKLER. Like what?

Secretary BALDRIGE. I could go into chapter and verse about how we have been sleeping at the switch for the last 20 years, and we ought to know what we are doing. You know, the decisions we make about our own policy is something else, but we ought to know what is happening, not just be wandering around in the fog.

Mrs. HECKLER. I think that is true, and I also feel that there's an absence of knowledge. Industry spokesmen constantly tell me about assets that their competitors receive from Government subsidies, et cetera, yet when we are considering a small research and development tax cut, for example, or a tax credit for research and technology—there is reluctance in the Congress to be helpful. There is a definite lack of awareness of the competitive assets that other partners have or enjoy, which places the American firm at a great disadvantage. So I can see the need for this.

Now in terms of the National Bureau of Standards, and in terms of the whole overall proposal of the reorganization of the Department of Commerce, what is your time frame as to when you intend to have this proposal available?

Secretary BALDRIGE. Well, our recommendations as to any revision of the NBS Organic Act should not take longer than 6 months. I'm not talking about a year or so, but I'm sorry that Mr. Shamansky left before I could add one further statement. I am not talking or thinking in any way of slowing down or holding back any improvements in the National Bureau of Standards. Those ought to go along. What I am talking about is additional responsibilities that we would be loading on them that we don't have now. This would not be a holding back of any improvements.

Mrs. HECKLER. Just one more question, if I might. In your testimony, you refer several times to the fact that the Organic Act is flexible enough to allow you to do anything you're presently considering. At the same time the GAO report states that the many activities mandated subsequent to the Organic Act have resulted in a loss of Bureau freedom to decide which programs are most important to the scientific community. Wouldn't it be safe to say that a

tightening of the NBS mandate would be beneficial to the organizations's efforts?

Secretary BALDRIGE. May I ask Dr. Ambler to answer that, because he is a little closer to it?

Dr. AMBLER. Yes; I think what the GAO report is referring to is there was a period that the Bureau went through, when we had a considerable number of new assignments through various pieces of legislation that did not come directly through the Organic Act. We have completed many of those now. It did have some of the effect that GAO says. There were corrective actions taken. The past administration proposed, and Congress approved, a long-range program that is called competence building. This program is to restore the long-range research capability of the Bureau of Standards, and we started in 1979. It is having a very salutary effect upon the Bureau. I've never seen any program in the time that I have been in the Bureau that has boosted morale and enabled us to bring in new blood, as that program.

So there have been steps taken to counteract what GAO saw. I think the section in the draft bill that Mr. Baldrige referred to, relating to the Bureau, of charging for work that we do for other agencies— work assigned to us through legislation—is very good. The Secretary certainly indicated his support of that.

Mrs. HECKLER. Thank you Dr. Ambler and Secretary Baldrige. No more questions Mr. Chairman.

Mr. WALGREN. Thank you, Mrs. Heckler. Mr. Ertel?

Mr. ERTEL. Secretary Baldrige, I was particularly impressed with your statement to Mr. Shamansky outlining the issues that you envision. I think government and private industry have a thoughtful way of looking at those, trying to see where you are going to in the future, as far as the program is concerned and analysis, before you make any changes, but it kind of leads me to wonder, if we start looking at such a broad spectrum, I am afraid sometimes you get too broad a picture and never get anything done in specifics. I just wonder sometimes if you get paralyzed by looking at such a broad problem enough to make anything very specific in trying to add up the small parts to make up the large part.

Have you thought about that, and where are we on that process?

Secretary BALDRIGE. Yes, sir. I have thought about that a lot, because my natural inclination, I guarantee you, is the other way. It is to get specific in a hurry, as soon as I have a broad outline figured out. I've got to say that I don't, and I don't know anyone in the Government that does have this particular point figured out yet. If you accept as a fact that tariff barriers and even nontariff barriers are rapidly being phased out by negotiation, they are still a bother, especially nontariff barriers in a lot of cases. However, the barriers are visible and people know about them. We are working on them.

The biggest problem we are going to be faced with in the next 20 years is the increase by many different means of subsidization by foreign governments to increase their competitiveness in world markets and thus increase exports.

We don't do that. What we have to address is the problem of what is the proper role of the U.S. Government in helping our industries increase their competitiveness. That is what I am wrestling with now. With very few exceptions, we don't subsidize our

industries. While we have subsidized Chrysler and Lockheed, that is not our normal way of doing things in the U.S. Government. We don't give the kind of economic subsidies to increase exports that other governments do in a lot of cases.

What is our role in getting U.S. industry competitive and increasing the productivity of U.S. industry? If productivity was just one large problem, which, as I mentioned before, if you could lean hard enough on the faucet, it would happen. That would be simple. We could address it, but it isn't. A thousand different factors go into productivity from how to manage work, capital, all the way to inventory control, and research and development, and so forth.

What is the role of the U.S. Government in that? It is something that we have not been able to fully come to grips with. We must, but it is not an easy problem.

Mr. ERTEL. I think you would agree with me that the Bureau of Standards has a well-defined role in this whole picture and has done a pretty good job, maybe even an excellent job, in setting standards, trying to develop a standardized base, if you will.

Secretary BALDRIGE. It's done a superb job in that area.

Mr. ERTEL. I noted from your statement, "It would be a mistake to alter the mission of the Bureau or otherwise affect its operation by legislation, until we see what develops in this new relationship with the rest of the Department of Commerce." I would like to mention that the Bureau's operation can be affected by administrative action, as well. I am a little reluctant to see the administration messing around, if you will, with the Bureau of Standards and making major changes. Some of the subcommittee members were at the Bureau of Standards last week, and I just thought you might be interested in some of the observations we made. We know that there is a 10-percent reduction in personnel at the Bureau of Standards, and yet you have said it has done a good job.

It's my understanding that the Bureau of Standards has operated with the same number of personnel for about 20 years, yet we see that from 1980, 3,130 people will be reduced in 1981 to 2,905 people and in fiscal year 1982, reduced to 2,759 people. That reflects a reduction of 225 positions for fiscal 1981, and 126 positions for fiscal 1982, or a total of 371. And they are preparing to phase out and abolish those positions.

Now if they have been working with about 3,130 people for the last 20 years—and you concede it's been a pretty good Bureau—and during this period Congress has added 20 laws expanding the Bureau's responsibility, requiring them to do additional work—one has to ask how this administration or any administration—I don't want to put it on this administration—can arbitrarily reduce the Bureau's force by 10 percent before an analysis has been done, and say "We will do a 10-percent reduction." How can you justify such a decision?

I have about 25 specific questions to go along with that, as far as what operations will have to be phased out or cut down. Maybe you would like to respond to the broader question first.

Mr. WALGREN. If the gentleman will yield, I know the Secretary has a commitment at 11 o'clock, and I don't mean to——

Mr. ERTEL. Then I'll reserve my specific questions.

Mr. WALGREN. Perhaps we can submit them in some kind of followup form.

Mr. ERTEL. If the Secretary would be willing.

Secretary BALDRIGE. I'll be glad to answer the broad question or rather several questions you asked.

Mr. ERTEL. Well, the broad question is based upon what I see as a commitment for the National Bureau of Standards. The fact that it has had 20 years of almost stable employment, and we have added responsibilities, and you have made a statement here, that it would be a mistake to alter those operations. So why a 10-percent, reduction? Why?

Secretary BALDRIGE. All right. In the first place, I think you overlook, sir, that over 20 years, there also have been some missions that have been reduced in importance. Events overtook them. You don't stay static for 20 years. There are responsibilities added, but there have been others lessened and I don't mean statutorily lessened, because statutorily I don't think the U.S. Government is in the practice of taking away anything for which there is no longer a use. They just leave it lying where it is. But during those 20 years there will have been some additions. There have also been some subtractions in responsibilities in the practical world.

In the second place, I know that it is difficult to, let's say, face up to what is called an arbitrary reduction. The fact is, I have spent 30 years of my life doing that—and this administration thinks the whole Government has gotten too large. If we start exempting certain agencies, whether it is the National Bureau of Standards or any other agency, and you can make a case for each one that it shouldn't have a reduction. But the practical fact is, I believe this firmly, that there isn't an agency in the U.S. Government or anywhere that you can't take 5 percent out in 2 years of personnel, 5 percent a year for 2 years, and have it run just as efficiently or in a lot of cases more efficiently than it did before.

I refuse to accept the fact that we cannot run the Bureau as efficiently to get the job done with two 5-percent reductions in 2 years. Now if we add any more to their responsibility, I will be the first one to come back and ask for more people if, as a result of what I was talking about earlier, we do, in effect, give them additional duties.

What I have been talking about, sir, is not messing around, as you put it, with the Bureau of Standards. What I am talking about is trying to give them more to do, as soon as we can figure out what it specifically should be, so that we can quantify it and qualify it, adding to their responsibilities, not subtracting or taking away.

Now there is room for disagreement with everything that I have said, but that is the way I honestly feel, and that is the way I would go about it. And far as specific individuals, I would have to leave that to Dr. Ambler.

Mr. ERTEL. If I may respectfully ask a couple more questions. I know you have got to go, but it seems to me you've said that you haven't fully analyzed the Bureau. I think anybody who is a responsible businessman—and you said earlier, that we ought to act responsibly—would analyze thoroughly if, in fact, there were reductions needed at the Bureau of Standards or other places in

Government. And I would agree with you that there probably are places that can be cut and should be cut.

But on the other hand, we have seen, complex measurements standards become more complex, not less complex, in the last 20 years. I remember a few cases back some years ago where we had no standards at all. We have been able to develop those. I think part of that has been with the National Bureau of Standards. But to arbitrarily cut personnel levels—now you might want to cut cost. You may say, we want to cut the money. And, therefore, you will cut out the bottom programs. It may be personnel or it may be overhead, but to just cut personnel leaves me somewhat astounded, as a good management technique, and you, I know, have been excellent in personnel management. I just wonder how you can come in and say you arbitrarily cut personnel. That is not a management technique.

Secretary BALDRIGE. Well, let me put that phrase in a different way. I did mention—and I am convinced of this—that the U.S. Government is too large. It spends too much money. That affects productivity. It affects all of the things we are talking about at the Bureau of Standards.

I think everyone has to share in some cuts. Now, that part is arbitrary. But it is not arbitrary when I look into the real world and see what has happened to our budget—inflation and everything else. The part that isn't arbitrary is when we decided that the Bureau—which is no different than the rest of the Commerce Department—has not grown. I don't know what has happened to the numbers over the last 20 years, but in the last 10 years, the Commerce Department has almost exactly the same number of people that it did 10 years ago; except for the additions that it got from Treasury and State last year, where the people came with them.

But if you put them to one side, the rest of the Commerce Department—it is exactly like the Bureau of Standards. We've got the same number of people as we did 10 years ago.

The nonarbitrary part comes in the fact that Dr. Ambler is going to be the one to decide where the cuts will come. And I have to leave it up to him, because he's the one that will have to run the Bureau with 5 percent less people each year. But I'll be glad to give him any help that I can on doing that. I do not think that is a major drawback in our proposed operation.

Mr. ERTEL. Thank you very much. I think that we are going to examine that issue. And I have a series of questions which I want to ask for consent that they be submitted to you in writing.

Secretary BALDRIGE. Thank you.

Mr. WALGREN. You may want to address some of those questions to Dr. Ambler who, I understand, will stay, although the Secretary has to leave.

If I might, Mr. Secretary, did I hear correctly that you were turning to Dr. Ambler and letting him decide whether or not he could run the agency with 5 percent less personnel?

Secretary BALDRIGE. No. We've said he must cut 5 percent for each of the next 2 years.

Mr. WALGREN. I see. So the nonarbitrary part is where to cut personnel——

Secretary BALDRIGE. Yes. Mr. Ertel was kind enough to mention that he thought I had had some experience in management over the last 30 years. I've made personnel cuts like this at least 50 different times over the past 30 years. One makes cuts when and where you have to.

I think we have to do it in the U.S. Government now, and we can make this kind of a cut without affecting the efficiency of the Department. As a matter of fact, there is a considerable body of opinion that across-the-board cuts of this magnitude result in greater efficiency. Cuts force you to think through the tasking for the whole outfit, not just NBS or the Department but for the whole Government.

But leaving that point to one side, as far as I am concerned, as long as we have reached the goals we have set, Dr. Ambler will be able to do his own shifting around of where to make the cuts.

Mr. WALGREN. Well, thank you very much. We appreciate your coming, Mr. Secretary, very much. With respect to your commitments, we'll turn to Dr. Ambler.

Secretary BALDRIGE. Thank you, Mr. Chairman.

Mr. WALGREN. Mr. Gregg? I'm sorry. Would you like to address anything, very quickly, to the Secretary?

Mr. GREGG. No. That is all right.

Mr. WALGREN. Thank you very much.

I'll turn now and recognize Mr. Gregg.

Mr. GREGG. Dr. Ambler, do you think that you have the expertise to do the handicapped part of the proposed revisions to the Organic Act?

Dr. AMBLER. There are certain areas in which the Bureau has unique expertise, such as in building research, which are relevant to the handicapped. So the capacity, in the sense of having the basic knowledge and skills, is there in a number of places. I don't remember all the individual things mentioned in the draft bill, but in building technology, the access and egress of buildings would be areas in which we have some operating expertise at the present time.

Mr. GREGG. What about computer aids and communications.

Dr. AMBLER. Communications, I would say not. The work on communications was transferred out of the Bureau some time ago, as part of the National Telecommunications and Information Administration in the Department of Commerce.

Mr. GREGG. How about computer aids? How do they relate to the handicapped?

Dr. AMBLER. I'm not quite sure what that would imply. I need time to think about what specific kind of program that would translate into.

Mr. GREGG. Do you do much work with computer facilities?

Dr. AMBLER. Yes. I would say in two ways. First of all, we use computers in practically all of our experimental work. The other is, we have an Institute for Computer Sciences and Technology. The responsibilities of that Institute are solely derivative of the Brooks Act, which relates to Federal procurement of automatic data processing equipment.

Mr. GREGG. Do you have anybody at the Bureau who has been involved in or is expert in disability engineering?

Dr. AMBLER. I'm not aware of it.

Mr. GREGG. So you would have to have a new function to take over the handicapped functions?

Dr. AMBLER. If our responsibility in this regard were to be broader than the areas that we are working in at the present time, yes.

Mr. GREGG. Well, I assume it would be. In order to have standards in the area of safety and performance, and computer aid and control, it would mean having engineers that know how to design and assess the design of handicapped facilities, whether it is especially controlled computers, for someone who does not have the dexterity to work a computer; or whether it is especially designed facilities for movement.

Dr. AMBLER. I don't think we have that expertise. In fact, we don't have a great deal of expertise at all in the area of human factors.

Mr. GREGG. That is what handicapped engineering is.

Dr. AMBLER. Correct. We do not have very much expertise in human factors.

Mr. GREGG. Do you think it is proper that it be in your agency? It is so human-related, and it is an expertise which evolves out of interaction with the handicapped.

Dr. AMBLER. I would doubt it, in the broad sense. I would be very sympathetic to trying to do something in those areas in which we have expertise.

Mr. GREGG. Well, I noticed, though, that Secretary Baldrige said the reason for not wanting NBS to do research into life sciences was that the Bureau did not have the background and ability. I'm not that familiar, quite honestly, with the Bureau. I am new to the Congress. I am, however, very familiar with handicapped care, having been president of a rehabilitation center which has a special program which designs engineering facilities for handicapped people.

I'm just wondering whether or not pure engineering functions—such as, I suppose, what the Bureau does—would be able to relate to handicapped activities, any more than you would be able to relate to life science issues.

Dr. AMBLER. I don't think so, readily, sir. In the area of life sciences and medicine, we have absolutely no expertise.

Mr. GREGG. We could certainly use some support in handicapped engineering, but I think it is going to mean that they're going to have to add an entire division. You're going to have to be closely related, probably, to the Rehabilitation Services Administration in HHS.

Dr. AMBLER. I'm not familiar with that particular division in HHS. But to do what you are speaking about, I think would mean adding new expertise that we don't have at the present time.

Mr. GREGG. What about in the area of fellowships?

I notice the Secretary suggested that you didn't want to be issuing fellowships. Could you expand on that a little bit? Is that a National Science Foundation function?

Dr. AMBLER. Yes. I think that is basically it.

My own point of view about this area and related areas in the draft bill is that we should be very concerned that the National Bureau of Standards remains a laboratory. Running a good laboratory requires a certain management approach, and a certain type of individuals skilled in the operation of that type of institution.

To add to the National Bureau of Standards functions which would have as their objective something other than implementation of the Bureau's mission would change the nature of NBS. Taking on the objective of improving the intellectual vigor, the scientific vigor of the country at large would give NBS responsibilities that would demand a whole different range of expertise; it would require grants administrators and a different form of management.

I think that kind of activity is done very well by the National Science Foundation. I wouldn't really see the necessity for the Bureau to get into it, when the job is done so well by another agency of the Government.

Mr. GREGG. I take it what you are saying basically is that you are a precisely defined expert group and you would rather remain in that field than to expand your field into areas where you wouldn't feel as comfortable?

Dr. AMBLER. Well, yes. And in the sense that I described——

Mr. GREGG. Does that reflect your comments generally? That was going to be my last question. I think you've pretty well answered it, but what do you think generally about the proposed bill, and what do you think should generally be the role of your relationship to the bill?

Dr. AMBLER. The Secretary has said that he would like 6 months to comment on it. There are clearly some things in it that we would very much favor, such as the provision which would make it obligatory for NBS to charge other agencies. There are also other provisions in it that seem to me to be very reasonable.

There are, however, provisions as summarized by the Secretary, one of which you've just been speaking about, which I don't feel very enthusiastic about.

Mr. GREGG. Thank you, Dr. Ambler. You are doing a good job out there, and we look forward to hearing from you in 6 months' time.

Dr. AMBLER. Thank you.

Mr. WALGREN. I would like to ask Dr. Ambler whether the basic Organic Act should state, as a basic mission, a contribution to technology and development for the Bureau?

Dr. AMBLER. No. I don't think it should, Mr. Chairman. There is language in the first Organic Act which, if I remember it correctly, authorizes, in addition to working on measurement standards, materials, and so on, work on "the solution of problems which arise in connection with standards."

I think the authority granted by this language is very important, also the mission and functions of the Bureau of Standards are well accepted by industry. We work with them extremely well. If we need to do some research in the area of technology, and if it is related to standards, then we can do it, and it is often significant research.

But to give NBS a mission that would include the actual development of technology—that is to say, the development of products or processes or machinery—would not in my view be appropriate.

Mr. WALGREN. Well, let me ask you this: When you say it would be appropriate to do certain things related to standards, it then by implication is inappropriate if not related to standards and to problems related to standards?

And it strikes me that certainly the computer integration of machine tools has a tenuous relationship to problems related to standards.

And my concern is this: Isn't the Bureau confined by that limitation of being able to spend Government dollars only on problems related to standards?

Dr. AMBLER. I think the automation program that we are setting up—which this committee encouraged and authorized for fiscal year 1981—and which I hope that we can expand in fiscal year 1982—is exactly the type of program that the Bureau of Standards should be doing.

We are not developing machine tools. We are not developing computers that would control machine tools. We are not developing robots, nor are we building any of these things.

We are extremely concerned because as U.S. industries, and particularly small manufacturers, decide to use automated machine tools and perhaps robots, there are going to be some very serious problems with the interfaces, with having computers talk to machine tools, having computers tell machine tools to cut things a little better than the cast iron allows them, with having robots talk to a machine tool and load parts, and so on.

It's precisely the problems at these interfaces that the Bureau of Standards is working on, and I would submit that the language of the present Organic Act is adequate for doing this type of work. That is my judgment.

Mr. WALGREN. I know that Congress has given you a number of specific directions encouraging you to take on a number of specific functions, in effect. And as I understand it, last year there was a mandate to engage in a core research program for innovation productivity. And it just strikes me that we wouldn't want the Bureau to have an arbitrary block on its ability to make progress in that area.

Let me ask you this: What has gone on in this core research program for innovation and productivity, and has it been strictly related to standards alone?

Dr. AMBLER. In the same sense that I illustrated with regard to the automation program, yes, it is related to standards. It is also related to other programs in measurement techniques—to the use of quality control in large-scale integrated circuits and in the area of materials. In the materials area, we are concerned not so much with standards as with critical data. The Organic Act, of course, covers that.

It is critical data relating to metallurgy that will be employed in developing new techniques for making different powder structures and for rapid solidification. So it is my judgment that yes, you can justify what we are doing in terms of the Organic Act.

I sense, though, that you are concerned that we might be held back by the Organic Act. I want to assure you that will not be the case. There are many important things that we take into account at the Bureau in deciding where we should be going.

First of all, we consider legislation, not only the Organic Act legislation but also our authorizing and appropriations legislation.

The second thing we consider is the position of the administration on these various issues.

Another set of factors that we take into account is our own assessment of technology. For example, we consider what important technology is coming up which is related to our mission, or for which the Bureau of Standards has special competence. We examine that technology to see whether we should be providing services in those areas.

In addition, we have tremendous interaction with the outside world, not only through the visiting committee and evaluation panels that meet with that assembly, but also it is part of every program manager's job to know what is going on on the outside relevant to his area.

It seems to me that all of these factors have enabled the Bureau to respond to changes quickly. The fact is that we have gotten to many of these new areas as a consequence of the authorization hearings that you have held. So it seems to me that in these authorizations we have an excellent opportunity for probing such questions, for asking for changes, and, more importantly, for your giving us a sense of the opinions of the committee.

It seems to me that we are now progressing well in our research program for innovation and productivity, and that we are making a valuable contribution. If we are not—if the committee feels that we are not, then we are very willing to sit down and talk to you about it.

Mr. WALGREN. Well, the Congress, it seems to me, has to somewhat protect the future of the Bureau. We wouldn't want you to face some administration, sometime 10 years down the road, which felt that somehow or other the Government was too big, and came in to you and said, "Well, obviously, you are engaged in a lot of activities that are way beyond the authorization of the act, and therefore, administratively, not programs which we encouraged you to engage in."

It seems to me very important that, as Congress, we keep your basic authority broad enough so that you cannot be limited. In my own view, thinking of the way appropriations are chartered, with broad authority, we don't want to make the Bureau vulnerable by going beyond the supporting structure of the act.

The Chair would like to recognize Mrs. Heckler.

Mrs. HECKLER. Dr. Ambler, I am getting the impression that you do not feel that it is necessary to revise the Organic Act. Is that correct?

Dr. AMBLER. I wouldn't go that far.

I think the Organic Act is a marvelous piece of legislation. In fact, one of the things I do from time to time is to read the original act. It does transmit to me very well, I think, the congressional intent. The version in 1950 is much more specific. It provides more

detail. But for philosophical guidance, the original act is a very impressive document.

I think that we should always be prepared to consider modifications or additions to the Organic Act, and I am open to that. But I am not of the opinion that it needs a massive overhaul.

Mrs. HECKLER. Well, then, what would you think is desirable? What changes in the Organic Act, in your judgment, would be appropriate, and wise?

Dr. AMBLER. Do you mind if I take a look at the draft bill again, and answer you?

Mrs. HECKLER. But I think it is very important to proceed.

I would like to know your reaction to Secretary Baldrige's proposed reorganization? Would you find it comfortable, and workable, to wait for his reorganization of functions and of missions and so forth, before having the Congress draft new legislation on the Organic Act?

Dr. AMBLER. Yes; I would, because I really don't sense a critical need for change.

I also think it is very important to wait to consider Mr. Baldrige's plans, because personally I feel very enthusiastic about what he is planning. And I am not just saying that because it is Mr. Baldrige's idea—I implied some of these themes even before Mr. Baldrige came here.

In fact, in testimony before this committee on the proposed National Technology Foundation, I indicated that many of the functions in the bill were better done in the Commerce Department. I have also always felt that focusing on the Commerce Department's activities in commerce, industry and trade—which is what Mr. Baldrige is doing, is needed. I might add that these are areas to which the Bureau makes direct contributions and that it is a very natural thing for the Bureau of Standards to make contributions in these areas.

Mrs. HECKLER. Then you feel it is appropriate to have this bill, but to wait until the Secretary implements the proposed reorganization or at least drafts it, or proposes it, and then have us, in the context of that measurement, consider revisions of the Organic Act?

Dr. AMBLER. Yes, ma'am.

Mr. WALGREN. If the gentleman would yield, I hope that the President doesn't look to the 1901 act for philosophical guidance.

And along that line, it might make sense to put into the record here section 4 of the 1901 Organic Act, which says that the officers and employees of the Bureau shall consist of a director, with a salary of $5,000; one physicist at an annual salary of $3,500; two assistant physicists or chemists, each at $2,200; one laboratory assistant; one secretary; one clerk; one messenger; one engineer; one mechanic; one watchman; and one laborer. And that's where you would be if we were following the act.

Dr. AMBLER. Mr. Chairman, with all due respect, the philosophical guidance is contained in sections 2 and 3 of the Organic Act.

Mr. WALGREN. Mr. Ertel?

Mr. ERTEL. Thank you, Mr. Chairman.

Dr. Ambler, just to follow up on Mrs. Heckler's statement, your answer, that you would feel comfortable waiting 6 months before we consider the Organic Act for reevaluation, would you also feel comfortable waiting 6 months before you consider the draft RIF's you're going through, which would change basically some of your functions?

Dr. AMBLER. No, sir, I would not want to do that. The Secretary explained the reasons for his decision. I have to implement that decision and I have to recommend ways that the Bureau can comply and get on with doing its functions.

The time that I took and the time that senior managers of the Bureau of Standards took in analyzing the whole situation, deciding exactly how we should proceed was very lengthy, but it was done very carefully. I cannot pretend it was something I enjoyed, but I think it was my duty to do it to the best of my ability.

It's my judgment that the strategy NBS has developed—and we have briefed you on the general strategy——

Mr. ERTEL. Well, we would call you a good trooper, or doing your duty, and I respect that. But on the other hand, there is always a question of the right thing to do—and that is what I am trying to get at.

Dr. AMBLER. The question of the right thing to do, as far as I am concerned, is how to implement——

Mr. ERTEL. In other words, you're not going to comment upon the policy judgment; am I free to say that? Would that be a straight-up situation, that you would prefer not to comment on the policy judgment?

Dr. AMBLER. For the 5-percent reduction issue?

Mr. ERTEL. Yes.

Dr. AMBLER. I would prefer not to comment.

Mr. ERTEL. I understand it, and I will not try to push you any further on that. But it is true that that 10-percent reduction will cut your work force below what it has been for approximately the last 20 years; is that correct?

Dr. AMBLER. Yes. You mentioned 20 years. Well, it will certainly cut the work force. Yes, you are right, sir.

Mr. ERTEL. What have you done, if anything, to try to reduce the number of staff being cut? In other words, as Director, did you go back and say that it was not right, if you felt that it was not right?

Dr. AMBLER. I did point out the difficulties that this 10-percent reduction would entail. As a matter of fact, the precise reduction that will be taken in the 2 years is 8.7 percent, and not 10 percent. And I like to think that my ability to explain the situation had something to do with that.

Mr. ERTEL. I have a series of questions, Dr. Ambler. I would hope that we could submit them, but there are just a couple that I would like to talk about, and that is the cost itself.

As the Bureau Director, you submitted a schedule of a savings of more than $1.7 million; and you also indicated RIF costs of over $1.6 million, of which $0.4 million were additional costs.

Does the estimate of RIF costs include ultimate cost increase, such as retirement cost?

Dr. AMBLER. This is Mr. Kammer, my Deputy Director.

Mr. ERTEL. I understand that he has a pretty good handle on those costs, probably more than you have, because he is the Deputy Director.

Mr. KAMMER. Sir, our estimate of cost does not include the cost of retirement. Those costs don't fall on the Bureau of Standards, but rather, on the Office of Personnel Management.

Mr. ERTEL. So if there were a cost of $0.1 million, or $100,000, from the cost of retirement, you're winding up with a 10 percent "hopeful" reduction utilization of personnel, which is probably going to cost you more in the next 2 fiscal years, and you're going to get less work. Would that be a fair analysis?

Mr. KAMMER. One would have to know what the plans were of people to retire, and I suppose some of these people would have chosen to retire anyway. They are exercising some form of eligibility.

Mr. ERTEL. Well, if they're going to RIF, they're going into early retirement; it's not that they were taking the original people. Every time it means that they get some additional benefits by retiring early.

Mr. KAMMER. There are 36 people out of the 172 we are planning to RIF that are eligible for some form of retirement. Of that, 22 are only eligible because of RIF. So of course, you're right. The remainder were eligible on a voluntary basis, and had not chosen to retire until this point.

Mr. ERTEL. All I can say is that, just based on black and white numbers, accounting function, I can't believe it's going to cost us less than $100,000 to RIF those people in early retirement.

And second, we wind up, because it is costing us more, losing maybe 10 percent productivity and 10 percent of the work at the Bureau of Standards.

Mr. KAMMER. For the 2 years of 1981 and 1982, I think your statement is correct, sir.

But of course, these people will not be collecting their salaries in the out years and over a period of 3 or 4 years, I believe the savings would outstrip the costs.

Mr. ERTEL. Unless, of course, the Secretary of Commerce may be wishing that the Bureau of Standards would be brought right back up to where it was.

Mr. KAMMER. Then the costs would have been——

Mr. ERTEL. Then we've blown it all. But I guess that is the conclusion that I come to.

I will be submitting a series of questions to you. I don't want to spend a lot of time on the RIF's, but it seems to me——

Have you been able to evaluate how much staff turbulence you will have, how much morale loss you will have, and how much productivity you will have lost by moving people into other areas where they aren't as qualified as they are at their present place, by bumping?

Mr. KAMMER. One can't assign a number to that, but it is thoroughly disruptive. We have found that when individuals are RIF'ed they probably have to consider three jobs before they settle on a job. And those jobs are filled by people who are subject to anxiety,

because they are threatened that perhaps they are going to be bumped.

Mr. ERTEL. Do you have any handle on how many people will move positions? As a result of RIF's, how many people are bumped down and how many people actually will be dislocated?

Mr. KAMMER. Yes, sir. I believe it will be on the order of about 150.

Mr. ERTEL. Who will be actually physically moved?

Mr. KAMMER. Yes, sir.

Mr. ERTEL. Plus people who go out permanently?

Mr. KAMMER. Yes, sir.

Mr. ERTEL. 150, or about 5 percent of your work force.

Mr. KAMMER. Yes, sir.

Mr. ERTEL. Besides losing 10 percent, you are going to move 5 percent.

Mr. KAMMER. Yes, sir.

Mr. ERTEL. Now, I understand that 40 to 45 percent of your research services are performed for other Federal agencies. The Bureau's scheduled reductions shows that 147 or 56 percent of the 263 expected reductions will affect work for other agencies.

Mr. KAMMER. Yes, sir.

Mr. ERTEL. Could you tell me, have you contacted those other agencies—to tell them that the Bureau will have to reduce the services that can be performed?

Mr. KAMMER. Yes, sir we have. The largest agency affected is the Department of Energy, and they are going through considerable change in direction themselves. And while simultaneously we were telling them that we thought we were going to have to reduce the amount of services provided, they were telling us that they were going to cut back on the amount of funding that they give us.

Mr. ERTEL. How much? Do you have any scope?

Mr. KAMMER. We currently receive about $22 million, total, from the Department of Energy. I believe that would be down to about $17 million in fiscal year 1982. So there is about a $5 million change there.

Mr. ERTEL. That $5 million change, are they planning to go out and recontract that somewhere?

Mr. KAMMER. No. As I understand what the agency has in mind, it represents work that will no longer be done.

Mr. ERTEL. In other words, they're just going to——

Mr. KAMMER. They're just going to stop it.

Mr. ERTEL. How about DOD?

Mr. KAMMER. DOD has not been reducing its requests to us, and I expect over the next several years that, given the expected growth of their budget, including their R. & D. budget, they'll ask us for more services.

Mr. ERTEL. How are you going to handle that with a 10-percent reduction in force?

Mr. KAMMER. We have a priority setting process that we go through for other agency projects, and the Department of Defense would go through that process like anyone else. One would expect that they would be assigned rather high priority, given the high national priority assigned to defense.

Mr. ERTEL. Is somebody at the bottom of those priorities?

Mr. KAMMER. Yes, sir.

Mr. ERTEL. So they'll go somewhere else.

Mr. KAMMER. Yes, sir.

Mr. ERTEL. Another contract possibly?

Mr. KAMMER. One would assume so.

Mr. ERTEL. Let me just turn to one other area. What effect would these reductions have on the Bureau's availability to complete projects for the other agencies? Are you going to have to cut any off that are presently being done?

Mr. KAMMER. No, sir.

Mr. ERTEL. In other words, you are going to be able to complete all of your projects?

Mr. KAMMER. Yes. We tracked this very carefully.

Mr. ERTEL. With the permission of the chairman I will submit the—let me give you the total number here—31 questions that we have for the department or the agency in writing. With the chairman's consent.

Mr. WALGREN. Without objection.

[Information to be furnished follows:]

National Bureau of Standards

Response to Questions at Oversight Hearings on June 16, 1981

1. **We understand that NBS has been operating for the past 20 years or so with a constant number of staff (about 3100), and during this period some 20 laws were passed giving you additional responsibilities. Most Government agencies, I would guess, have grown significantly during the past 20 years. But NBS now has to cut its staff below what it was 20 years ago. Isn't that right, and would you tell us what NBS has done, if anything, to try to reduce the number of staff to be cut?**

   For the decade from 1970 to 1980, NBS full-time permanent, end of-year employment varied between approximately 3,100 and 3,350. NBS management has taken several actions to reduce the number of staff who have to be cut in fiscal years 1981 and 1982: The total number of reductions at NBS was reduced by the Department of Commerce (DoC) after reviewing impact statements provided by NBS. In addition, the entire NBS staff was analyzed to locate all of the staff members who could be reassigned to positions in new program areas. NBS management has also worked with affected staff members to facilitate both retirement and private sector job possibilities.

2. **What accounts for the difference between the OMB FY 1981 and 1982 reductions and the Bureau's scheduled reduction?**

   There is no discrepancy between the OMB fiscal years 1981 and 1982 reductions and the Bureau's scheduled reduction. The NBS share of the DoC reduction is 263 for the combined fiscal years which is 8.4 percent rather than 10 percent. The final number was decided after NBS made an appeal based upon programmatic impact and was possible because of other programmatic reductions in the Department. The additional reductions at NBS in order to meet the end of year FY 1982 ceiling are principally the result of the Carter two-for-one freeze. In addition to the reduction in employment ceiling, there is staff dislocation due to the need to reprogram into new initiatives. Approximately 25 RIF's are the result of FY 1981 reprogramming.

3. **When will the RIF take place?**

   The RIF is already taking place and will be substantially complete by the end of FY 1981.

4. **If the RIF was accomplished just before the end of the fiscal year allowing for maximum attrition, would the Bureau have to separate fewer employees?**

   NBS took into account the total attrition during FY 1981 and FY 1982 before determining the number of employees who would be affected by RIF. In order to meet the FY 1981 ceiling, the Bureau has to conduct a RIF in FY 1981 even if the FY 1982 reduction had been deferred until that fiscal year. This RIF could not have been substantially deferred while still separating the required number of employees by the end of the fiscal year.

5. **Could staff turbulence be better reduced by allowing attrition to reduce the number of employees that would have to be separated?**

In our view, staff turbulence could not have been reduced by waiting for attrition before conducting the RIF. Because the RIF process takes approximately five months, it had to be initiated promptly in order to meet the end of year FY 1981 ceiling. Attrition during both fiscal years was estimated in order to reduce to a minimum the number of employees who were directly affected by the RIF.

6. **What was the basis for allocating the reductions?**

The reductions were allocated programmatically. The NBS Director informed the Director of each of the Bureau's major organizational units (MOU) of his priority order. Highest priority for protection in the RIF these was given to NBS programs in basic measurements, standards, and data; then to the Competence projects; the new thrusts in support of industrial productivity (VLSI, Automation, Metals) and finally to the remainder of the Bureau. Based on these priorities, the MOU Directors determined the reductions to be taken within their units. In this process they followed the general guidance from OMB to assign half the reduction to the other agency program and half to the NBS appropriated program.

7. **What research programs will the RIF impact the most?**

Because of the high priority assigned to programs in support of industrial productivity, the RIF will have its greatest impact in areas of social technology. In particular, the largest reductions in NBS appropriated programs will occur in the areas of consumer technology and building technology. The largest reduction in the other agency program is expected to come in work supported by the Department of Energy.

8. **Was work load used to allocate cuts? If work load was used, what means does NBS have for determining its work load and the work force needed to accomplish it?**

The NBS work load and work force are managed by the program managers. NBS uses a cost center system to account for both expenditures and staff years on a project basis. Work load, particularly in the case of the reimbursable program where decreases are occurring as a result of cuts in the programs of other agencies, was one of the factors which determined how personnel reductions were to be made.

9. **Is the allocation of the reductions expected to result in the least disruption, the least increased cost, and termination or delay of the lowest priority work load?**

The allocation of the reductions is expected to cause a termination or delay of only the lowest priority work load. In this regard, the staff disruption and the costs are minimized. However, disruptions due to the bumping process, the increased cost due to severance pay, processing costs, and the costs of early retirement cannot be avoided.

10. **Will the reduction cause projects or tasks to be delayed or canceled?**

There will be some unavoidable delays as a result of the reduction, both due to the decreased staff and the need to retrain employees who have bumped into new positions. NBS expects to fulfill its FY 1981 obligations to other Federal agencies, but based on joint review with the agencies, some of the reimbursable work will be terminated at the end of FY 1981.

11. **Could you tell us what agencies are your major clients?**

Each year, more than 100 Federal agencies receive reimbursable services from NBS. For FY 1980, the Bureau's principal clients in descending order were the Department of Energy, the Department of Defense, the Federal Emergency Management Administration, the Environmental Protection Agency, Health and Human Services, the Department of Commerce, the Department of Transportation, the National Aeronautics and Space Administration, Housing and Urban Development, and the Department of Justice. These ten agencies accounted for 90 percent of the Bureau's income from the Federal Government.

12. **What effect will these reductions have on the Bureau's ability to complete projects for the other agencies? Specifically how will DoD and DoE be affected?**

The NBS personnel reductions will not interfere with the Bureau's ability to complete other agency projects which are already funded in FY 1981. Some projects of a continuing nature will not be renewed in FY 1982. We do not expect the Department of Defense to be substantially affected, however, a significant decrease is expected in energy-related programs. The biggest changes will come in the areas of solar energy and appliance energy standards.

13. **If projects are delayed, what effect will the delays have on the requesting agencies' missions.**

There will be some delays, especially as a result of the bumping process which is beyond the control of NBS management. NBS works closely with the other agencies and is sensitive to their mission-related requirements. Every effort will be made to avoid serious problems.

14. **Has the RIF been discussed or coordinated with the affected agencies?**

Many other agencies are undergoing personnel and budget reductions at the same time as NBS. As much as possible, NBS is working to coordinate its reductions with parallel reductions in other agencies. NBS policy is to discuss all reductions with the affected agencies in order to help determine priorities for the work which will be done.

15. **If projects are canceled, how will the requesting agency accomplish the project. What effect will cancellations have on the requesting agency's mission? Will the reduction cause projects or tasks to be contracted out?**

NBS expects that the reductions in personnel working in the reimbursable program will parallel corresponding program reductions at the other agencies. However, in some cases, NBS expects that agencies will have difficulty accomplishing terminated projects. Some may be contracted out, but this may not always be possible since the majority of NBS contracts involve traceability to the national standards, the development of very accurate measurement techniques for the properties of materials, or other services where NBS expertise or facilities are unique.

16. **Would Bureau projects be considered commercial or industrial type activities subject to A-76?**

Reimbursable services provided by NBS to other Government agencies are not automatically excluded from the requirements of OMB Circular A-76. The principal responsibility for compliance with this Circular is, of course, on the part of the contracting agency. However, in order to avoid any possibility of job-shop type activities at NBS, the Bureau requires that all reimbursable services to other Federal agencies satisfy one of eight criteria: 1) acceptance by NBS establishes traceability of measurements to national standards; 2) private sector cannot or will not develop the required test methods; 3) support services to other agencies authorized or mandated by specific legislation; 4) a contract placed outside of the Federal Government would result in an unavoidable conflict of interest; 5) requirements for accuracy of physical constants and properties of materials cannot be met by other sources; 6) unique capability of NBS required for support services to other agency; 7) use of private sector source by other agency would cause significant and intolerable delays in providing services and results; and 8) use of a private sector source by other agency would result in a higher cost to the Government.

Generally, work will not be accepted from another agency solely because it will be less costly to the sponsor. In the rare cases where it is felt that NBS should accept other agency work solely on the basis of this criterion, specific approval supported by comparative cost analysis prepared by the Budget Division must be obtained in advance from the Director.

17. **Could Bureau projects be contracted for consistence with OMB Circular A-76 guidelines? If not, how could the projects be accomplished?**

In principle, other agencies could contract out for some of the services provided by NBS. However, services could not be contracted out in cases where: 1) traceability to the national standard is required; 2) services are mandated by specific legislation; or 3) a contract placed outside the Federal Government would result in an unavoidable conflict of interest.

NBS will continue to accommodate all of the requirements for its services which fall in these three categories.

18. **What is the estimated increased cost of contracting for projects or tasks that will not be possible for the Bureau to accomplish because of the act.**

NBS does not know how to estimate the change in cost for projects or tasks that will not be possible as a result of the personnel cut.

19. **Will the Bureau or the requesting agency have to contract out to accomplish the projects for other agencies?**

Because of the restrictive nature of the NBS criteria for acceptance of other agency projects, NBS management expects that many of the projects terminated by NBS will not be done at all. For the most part, we expect NBS reductions in the reimbursable program to parallel programmatic reductions in other agency programs so that the dislocation to the Federal agencies will be kept to a minimum.

20. Does the estimate of RIF costs include all Government costs such as increased retirement costs?

NBS estimates for the cost of the RIF include direct costs of administration, the cost of severance pay, and unemployment reimbursement to the Department of Labor. NBS does not know how to estimate the increased retirement costs, and these are not included.

21. What is the basis for the computed savings?

The savings were computed in a uniform manner throughout the Department of Commerce. They are based upon an average grade level which has been estimated for all departing personnel and an estimated lapse to take into account the lengthy RIF procedure. The RIF savings do not annualize until FY 1983.

22. Have you estimated the additional costs of such things as lost productivity, retraining, and other disruptions the RIF will cause? Can you measure such costs?

NBS management believes that the costs of lost productivity, retraining, and other disruptions due to the RIF are substantial. Development of numerical estimates would be extremely difficult and costly and their accuracy would be questionable and the Bureau has not attempted such estimates.

23. Will the savings be applied to other Bureau costs or will the budget be reduced accordingly?

Part of the savings have been applied to offset the FY 1981 pay raise supplemental. Other savings have been applied to reduce the budget in FY 1982.

24. What was the basis for determining the competitive areas and levels?

- A competitive area outlines the boundary in which an employee whose position has been abolished can compete to retain employment. Federal personnel regulations define a competitive area as being within a commuting area. For NBS, therefore, Gaithersburg and Boulder are separate competitive areas. All NBS employees in the Washington, D.C. metropolitan area are in the same competitive area.

- A RIF competitive level consists of groups of positions in the same grade or occupational series which are similar in duties, qualifications requirements, and pay schedules. Incumbents of these positions constitute a competitive level group. A single position can occupy a competitive level by itself.

25. Could staff turbulence be reduced if the competitive areas were more narrowly defined?

Most of the reductions are in Gaithersburg, Maryland. It is not possible to make the competitive area narrower than the commuting area.

26. **What effect would narrowing the competitive area have on the Bureau's ability to retain needed experience and expertise?**

There is no reasonable way to narrow the competitive area.

27. **Will the reduction result in a work force composed of employees that largely will be retiring in the near future?**

Experience during this RIF indicates that many employees who are eligible to retire are choosing to do so. As a result, there may be a reduction in the number who will be retiring subsequent to the RIF.

28. **Will early retirement authority be requested from OPM?**

Yes. Early retirement authority was requested in May 1981, but no reply has been received.

29. **How many employees would be eligible for early retirement, and how much will early retirements add to RIF costs?**

Early retirement authority has been requested from OPM. 1,901 full-time permanent positions are covered in the requested coverage. Of these positions, the number which have been abolished by reduction in force is 116. 251 employees of the 1,901 covered are eligible to retire early. We expect approximately 10 to 15 percent of this number to accept this option if the authority is granted by OPM. NBS has no estimate of how much early retirements will add to RIF costs.

30. **What efforts will be made to place employees in other Government positions?**

Substantial efforts are being made to place NBS employees in other Government positions. The Bureau has initiated an Employment Outplacement program which not only covers other Federal agencies but also private sector positions. This program does not locate possible jobs for NBS employees but assists them in the preparation of their CV or SF 171 and advises them on techniques for locating new positions.

31. **What is the estimated effect on the agency's work load of the "bumping" process where displaced employees are placed in occupied positions?**

Employees bump into occupied positions when it is determined that they can do the job in a satisfactory manner within 90 days. Bureau management believes that the bumping process will produce an initial decrease in job performance which will eventually disappear as displaced employees are retrained and accommodate to their new positions.

Mr. ERTEL. Thank you.

One other question, Dr. Ambler. I heard your interchange with Mr. Walgren, and we had that same interchange out at the Bureau on Monday last. I am not sure I quite follow your reasoning for automatic processing machine tool sort of thing. What you were doing there was drilling holes, and then going back and correcting the computer so that your tolerances came down to acceptable tolerance, and then you systematically corrected the error, either the error of system or the random error. That is a measurement process rather than a production process, and I'm not saying it's wrong to do that, but I don't understand how you get that into your defined job related to measurement. I went to engineering school and we had that in production engineering, trying to correct error. We measured it against the standard, but we always tried to correct error, and that was a production process, I thought. Maybe I'm wrong.

Dr. AMBLER. In some respects you are right. But I think I am right too. The outcome, I mean the specific thing that you described, very accurately, is an outgrowth of the Bureau's very basic work in dimensional metrology. In the past we essentially made standard gauges for screws and gears and the like and used these standards for transfer of dimensional measurement accuracy to industry. Then we realized that the sheer numbers of different kinds of artifacts needed was so great that we couldn't address the problem in that way. There had to be another way to provide measurement services, and at that point we began work on measuring machines. The Bureau's work with three-dimensional machines for measuring things showed that with software you could make measuring machines measure better than cast iron would allow. Our work showed how a three-dimensional measuring machine can be used with a computer to do inspections of objects of arbitrary size.

Now the use of metrology in that field is changing. Instead of taking parts off a machine tool, measuring them, and then putting them back on, the measurements can be done with the parts in place. I would submit that this kind of an operation, while you can view it from the point of view of a production engineer, is, from my point of view, on-line inspection in metrology.

So that is the position I take on it.

Mr. ERTEL. Thank you very much. Thank you, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Ertel.

Well, the committee may have other questions that we would like to submit to you in writing, Dr. Ambler. We certainly appreciate your time and patience. I think it should be clear that the members of the committee think very highly of how you have directed the Bureau and look forward to working with you in that capacity.

Dr. AMBLER. Thank you very much.

Mr. WALGREN. Thank you, Dr. Ambler.

The next witness is Dr. Herbert Fusfeld. Dr. Fusfeld is the director of the Center for Science and Technology Policy at New York University. Dr. Fusfeld is also a member of the Advisory Council of the National Science Foundation and has written widely in areas

that are under discussion here today. We welcome you to the committee, Dr. Fusfeld.

We understand you have a written statement, and it will be made a part of the record as a matter of course. So please feel free to summarize or highlight in any way that you feel would be best.

[The biographical sketch of Dr. Fusfeld follows:]

Biographic Material

Dr. Herbert I. Fusfeld

Dr. Herbert I. Fusfeld is Director for the Center for Science and Technology Policy at New York University. The Center is part of the Graduate School of Public Administration, and was initiated in September, 1978 to develop an independent approach to, and understanding of, science and technology policy.

Dr. Fusfeld received a bachelor's degree in physics and mathematics from Brooklyn College in 1941, followed by an M.A. and Ph.D. in physics from the University of Pennsylvania in 1945 and 1950.

During World War II, Dr. Fusfeld conducted research in solid state physics at the Frankford Arsenal, serving as Head, Physics and Mathematics Division. This involved programs in plasticity, metal physics, and internal friction of metals. He also served as a lecturer in mathematical physics at Temple University, and as Visiting Lecturer on Metal Physics at the Graduate School, University of Pennsylvania.

Dr. Fusfeld joined American Machine and Foundry Co. in 1953, serving as Director of Research from 1954-1963. He organized their Central Research Laboratory, initiated a British research laboratory, and served on the Board of Directors for the cooperatively-owned Industrial Reactor Laboratory.

He became Director of Research for Kennecott Copper Corporation in 1963 and served in that capacity till 1978. This included development of new copper products, leading to establishment of a business for solar energy collectors. Dr. Fusfeld served as chairman of a committee for energy conservation in non-ferrous metals, acting as representative for that industry to Federal energy authorities.

Dr. Fusfeld is a member of the Board of Directors of the Hazeltine Corporation.

He has been active in the U.S. physics community, and has held many positions with the American Institute of Physics. He served on their Governing Board from 1967-1970, and has been a member of the Long Range Planning Committee, Advisory Committee on Physics Manpower, and Chairman of the Corporate Associates Advisory Committee.

Dr. Fusfeld has been particularly active in the field of research management. He has served in many capacities within the Industrial Research Institute, and was President of I.R.I. in 1973-1974. He then became Chairman of its Federal Science and Technology Committee from 1974-1976. He was Vice President of the Research and Development Council, American Management Association, and a member of the AMA Board of Trustees.

He has served in numerous activities with the U.S. government. At the National Bureau of Standards, Dr. Fusfeld was a member of the Advisory Panel for the Institute of Materials Research 1976-1977, and chairman in 1977-1978. He was also a member of the Advisory Panel for the Experimental Technology Incentives Board 1974-1975. He served on the Numerical Data Advisory Board, National Academy of Sciences, 1970-1975.

Dr. Fusfeld has been a member of the U.S.-U.S.S.R. Joint Commission for Scientific and Technological Cooperation 1974-1979. He serves on the State Department Advisory Committee on International Investment, Technology and Development 1975-present. He has been a member of the Board on Science and Technology for International Development; National Academy of Sciences 1977-1979.

Dr. Fusfeld is a member of the Advisory Council of the National Science Foundation 1977-present. He served on the Expert Group for Technology and Economic Growth, OECD, 1976-1979. He has been a member of the National Materials Advisory Board 1975-1979, including membership on its Committee on Critical and Strategic Materials. He has been on the Advisory Board for the School of Materials Science, University of Pennsylvania, 1968-1979.

Dr. Fusfeld has written numerous articles in physics of metals, research management, and science policy. He is co-editor of a recent book "Science and Technology Policy: Perspectives for the 1980's," New York Academy of Sciences, 1979.

STATEMENT OF DR. HERBERT I. FUSFELD, DIRECTOR, CENTER FOR SCIENCE AND TECHNOLOGY POLICY, NEW YORK UNIVERSITY, NEW YORK, N.Y.

Dr. FUSFELD. Thank you very much, Mr. Chairman. I appreciate the opportunity to be here.

NBS has certainly played an important part in the strong foundation for the technical strength of this country. The continuing importance of its current functions is beyond question but there may well be added contributions to the relations between our public and private sectors.

My remarks are directed to this subject. I will present the abbreviated version of the first part of my detailed remarks and quote somewhat from the remainder.

My perspective of NBS is based on 25 years in industrial research management, and therefore it is a bit easier for me to understand and to evaluate the Bureau's activities by considering the analogy with a central research laboratory of a large multidivisional corporation.

My emphasis, and the area where most considerations of public policy and policy change enter, is with the role of NBS in the Federal support of civilian sector technology.

In this sense, all of the Federal R. & D. efforts in this area can be looked upon as a central research laboratory with NBS as the principal broad scientific establishment that is not tied to a mission agency in any given end item or industrial sector. The private industrial sector then constitutes the operating divisions which are the direct users of NBS output in the civilian sector. And, of course, we have the combined authority of the President and Congress representing our national top management which can approve special procedures or overrule a local operating unit when necessary and desirable.

I had used this analogy in previous testimony on February 6, 1980, to examine the functions to be expected of NBS. It is equally useful as a basis for looking at the relations between NBS and industry.

With regard to the questions of how programs are initiated, how the results are transfered and who makes the decisions, the answers to these questions are at the heart of the changing environment for the development of current policies.

Consider Federal R. & D. support for the civilian sector. Very briefly, we went through a rapid increase in Federal R. & D. from 1950 through 1970, driven by public sector needs, that is, areas where the Federal Government was the final customer, as in defense and space. After 1970 we began to expand Federal R. & D. support in areas where the Federal Government was not the final customer, motivated by concern with the domestic economy, productivity, and our international competitive status.

This raised very serious public policy issues and the changing environment for Federal actions regarding the private sector is a stimulus today for reexamining the basis for such R. & D. and developing appropriate criteria, for these activities.

One guide to these relations is found in looking within a corporate structure. The decisions on the relative importance of the programs on the timing and means of transferring results and

applying technical change normally are left with the business units. Those actions necessary to maintain a strong scientific competence in initiating new technical concepts to maintain liaison with the outside world of science and technology normally stay with the independent authority and funding of the central laboratory.

Exceptions occur informally with good working relations between the central laboratory and the operating divisions or by the formal action of top management, for example, encouraging the central laboratory to pursue new concepts through initial stages of new business that lies outside existing operating units.

To apply this analogy across the public-private interface, the critical factor is to establish mechanisms for obtaining inputs from "business units," that is from the industries involved in this specific program, so that their judgments on markets, manufacturing, finance, and so on become part of the decisionmaking process.

Consider the results of two programs initiated in the past 2 years, which were recently canceled. I refer to the cooperative generic technology program, or COGENT, and the cooperative automotive research program, or CARP. In retrospect, there were two defects built into the programs despite the well intentioned efforts of the initiators to avoid them.

First, the problems selected were not necessarily those of the higest priority concern to the industries affected. And therefore, second, the coupling with and the ultimate transfer to industrial use were not well defined, nor was industry exploitation highly probable.

Both difficulties would be minimized automatically if the initiative came from industry. This is not a necessary condition, as competent central laboratories must be encouraged to take initiatives. But initiatives from the central laboratory carry obligations, and these obligations are understood instinctively in a corporate laboratory, not always in the Federal Government.

I anticipate that there will be similar initiatives proposed in the next several years. The concern with productivity and our international status in foreign trade will be with us indefinitely and the role of the Federal Government will be a continuing issue of public policy.

The particular area of R. & D. should be addressed, I believe, from the same view of the Federal Government as a central laboratory. Specifically, therefore, I recommend that the National Bureau of Standards should act as the initial interface between Government and industry when such programs are being explored, and particularly if in-house Government facilities would be involved.

If I may quote from my prepared remarks, clearly NBS cannot take on expanded responsibilities with present personnel alone. But I do not anticipate any sudden or continuing activity. I am saying that as the subjects arise naturally, whether in some Government agency or industry, there should be a general recognition that NBS should be a party in the earliest discussions if some direct Government R. & D. involvement is anticipated. Thus the initial role is that of adviser to insure that the Government acts in the role of central laboratory. This role includes the need to obtain factual inputs and judgments from the industries concerned.

Should the need for exploratory experiment arise the Bureau should be evaluated as a possible first home.

I would expect that in most cases the experiment would be terminated after a trial period, or transferred to a more permanent home, as in the case of telecommunications.

In other cases, as with building materials research, a longer term organization emerges, and funds would have to be added to the NBS appropriations or be provided by the agencies or industries interested in the program.

While this can lead to some growth for NBS, I believe it will result mostly in transfer of successful exploratory programs to permament homes. These could be other Government agencies, independent centers or universities, but would take place after some elements of stability are built in.

Frankly, my principal reason for advocating this often thankless role for NBS is that the greater the interactions with the spread of industries the greater the likelihood that reasonable criteria will be developed for such interactions arising from experience and mutual confidence. An indirect benefit may be the identification of useful additions to the Bureau's ongoing activities in measurements and standards as NBS is exposed to industry needs and procedures.

In no way should such interactions subtract from the fundamental NBS missions or represent more than a modest proportion of total NBS activities, say 10 to 15 percent.

As I mentioned earlier, a critical obligation of a constructive central research laboratory is to maintain its own long-term health in order to best work with operating units. Merely responding to requests for service is not in the long-term interest of NBS or the users, public or private.

I believe we can learn much in this area from the experiences of other industrialized OECD countries which have engaged in such linkages between Government laboratories and private companies.

In the Netherlands, for example, the TNO organization is set up and heavily supported by Government. But it is operated outside the Government structure. It has substantial contract work with industry. There are separate institutes related to different industry sectors and each one is governed by a board which has representatives of Government, science and the user industry.

The United Kingdom has introduced two other innovations into its Government R. & D. operations.

First, each Government laboratory makes some use of a customer contract principle. In this, the customer, whether a private company or another Government agency, agrees with the laboratory on the time and costs to meet a set of objectives and then funds the program.

Second, there is a set of requirements boards set up by the Department of Industry which cover a number of major sectors, such as chemistry, electronics, and so on.

Each board has about half its membership from industry and the rest from Government and academia. The boards review suggested Government programs and provide judgments on industrial need, market impacts, and competitiveness as well as technical feasibility.

There are other interesting cases, such as the West German system of strong linkages among all the research groups—Government, industry, university, and the major independent research establishments.

Clearly, no one technique can be transplanted to the United States It could, however, suggest some approaches that could meet U.S. criteria or provide a means of judging the impact of new programs considered for NBS.

Now there is one thread running through these examples that relates to the purpose of these hearings. Major research organizations, either within the Government or operating under substantial Government subsidies, have successfully developed constructive linkages with industry starting from the foundation of a strong scientific base that is independent of any immediate industrial need. Now, as a result such organizations have tended:

First to preserve their technical competences and plan for a stable growth.

Second, to provide a flexibility and diversity that can meet new challenges of industrial growth, and

Third, to restrict the extent to which a program might proceed towards commercialization because that would be a diversion from the overall mission and interests of these organizations.

Thus, the mission of NBS not only provides a sound base for involvement with civilian-sector R. & D., but it should also act as a self-limiting mechanism. In this sense, the nature of any R. & D. activities at NBS would not differ in kind because it supports an area of concern to industrial growth as contrasted with concern for the missions of public agencies.

The activities are within the scope of technical activities listed in the Organic Act. There is broad flexibility conveyed by article 272 authorizing the Secretary of Commerce to undertake these "and similar ones for which need may arise in the operations of Government agencies, scientific institutions, and industrial enterprises."

I believe, therefore, that any programs conducted by NBS which emphasize scientific and engineering support for civilian-sector needs are logically within the functions listed by the Organic Act.

In conclusion, I have tried to make a few simple points about the role NBS can play in our changing view of interactions between the public and private sectors.

The Federal Government has moved over the years in its R. & D. activities from strengthening the infrastructure of science and technology to direct support of specific civilian-sector programs. While such interactions will undoubtedly continue, we are currently questioning past programs and attempting to develop criteria by which Government efforts can provide the proper needed support without taking on decision making in areas of industrial competence.

I have proposed that NBS be considered in the planning stages and, if necessary, in providing an initial home for exploratory programs where some collective technical program is considered for the civilian sector. Using the analogy of a corporate central research laboratory interacting with operating business units, I suggested that certain criteria emerge logically; specifically relating to the early and continuing involvement of the ultimate user.

A specific recommendation is made to examine the procedures of similar national laboratories in other industrialized countries, most of which have had longer experiences in Government-industry interactions along these lines.

Finally, it seems that such actions would be modest extensions of NBS capabilities and should require no change in the Organic Act.

Now, these are times of change, particularly in our public-private sector relations. In the areas of science and technology policy, a period of exploration, of experimentation may be in order. It is in that spirit that I recommend that NBS take a key role. In a later period, after our experiments are run, some longer term changes may then be considered. I am looking to minimize uncertainty in a time of change, and this is precisely the contribution that NBS can provide.

Thank you very much. I'd be delighted to answer your questions.

[The prepared statement of Dr. Fusfeld follows:]

STATEMENT OF HERBERT I. FUSFELD
DIRECTOR, CENTER FOR SCIENCE AND TECHNOLOGY POLICY
NEW YORK UNIVERSITY
BEFORE THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE AND TECHNOLOGY
U. S. HOUSE OF REPRESENTATIVES
ON THE AUTHORIZATION OF THE NATIONAL BUREAU OF STANDARDS

JUNE 16, 1981

Mr. Chairman and Members of the Subcommittee:

It is a privilege to have the opportunity of presenting to this SubCommittee some comments on the activities of the National Bureau of Standards. Just 1½ years ago, on February 6, 1980, I testified before this same Sub-Committee on the trends that appeared to be taking place at NBS in order to provide some input as to the adequacy of NBS funding with respect to its current activities and objectives. That was part of your authorization hearings on the NBS budget.

The concern of the present hearings is with the adequacy of the Organic Act establishing NBS with respect ot the changing needs of our society and the implications these can have for the future activities of NBS. My remarks today will be an extension of the earlier statement, and will address the opportunities for, and the potential role of, NBS in developing constructive interactions between the public and private sectors.

Permit me to summarize briefly the principal thrust of my earlier testimony. As I mentioned then, these comments are based upon 25 years of experience in industrial research management. I am therefore giving judgments from a largely industrial viewpoint, but one that takes in membership as an industry representative on a great many panels, committees and commissions that required cooperative inputs from industry, government and academia. This included service on Advisory Panels of NBS, with one year as chairman of the Advisory Panel of the Institute of Materials Research prior to the current organizational structure.

From this background, I had presented a perspective of the functions and priorities for NBS by analogy with the roughly comparable functions of a central research laboratory within a large corporation, which also conducts R&D within a number of divisions or subsidiaries. Briefly, these functions normally include:

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1. Pursuit of those areas of basic science or engineering which strengthen present products and processes or open the possibilities for new business opportunities.

2. Offer specialized technology services based upon the skills of the people available or the unusual nature of its facilities.

3. Provide a base for exploratory programs leading to possible new business interests, and carrying out the initial stages.

The Bureau, of course, performs all those functions, although we have to think of these in terms of national missions, needs and opportunities rather than the products, processes and business developments characteristic of the private corporation. In particular, the unique and critical mission of the Bureau to provide measurements and standards in support of trade and commerce gives it these important elements of a national central research laboratory:

1. Those specific objectives strengthen the technical base of the nation in both the public and private sectors.

2. The continuing efforts in basic science and engineering necessary to advance the development of changing needs for measurements and standards result in a general strengthening of the reservoir of knowledge available to all sectors.

3. The unique facilities available at the Bureau required for its basic missions can play an important role in cooperation with other technical activities of an appropriate nature in government and private laboratories.

A final point referred to in the earlier testimony is the ability of the Bureau to serve, on a limited basis, as a temporary home for new exploratory programs. This occurred in the field of telecommunications, and might well be a starting point for other new initiatives.

These capabilities and functions of NBS derive logically from its basic mission as described in the Organic Act. They can be evaluated in terms of the analogy I have suggested with a corporate Central Research Laboratory. That was the thrust of my earlier testimony regarding the allocation of funds for the Bureau's activities, including other-agency funds.

I would now like to expand these perceptions of the Bureau in order to consider its role in the broader field of relations between the public and private sectors with regard to technical activities. The interactions between the Federal government and the private sector in the areas of research and development have changed in both intensity and in nature during the past 100 years, but they have changed sharply during the last 30 years, and they are changing again in the period we are in now. While these changes will affect all government agencies concerned with the conduct of R&D, they may offer particularly constructive opportunities for NBS.

I would like to spell out (1) in what way government-industry R&D relations are changing, (2) the activities these changes could imply for NBS in the light of current issues in science and technology policy, and (3) the relation of any new programs of NBS to the Organic Act.

The enormous growth of Federal support for R&D after World War II ($2,753,000,000 in 1953 to $14,668,000,000 in 1970)* was based upon national needs in the public sector, i.e., defense, nuclear energy, space, and health. It also included increasing support for basic research through NSF, NIH, NBS and others. In short, the thrust of Federal R&D before 1970 was primarily to support specific objectives for which the government itself was the final customer, or to strengthen the scientific base of our overall technical structure, both public and private.

After 1970, there was steadily increasing support of R&D by the Federal government intended to strengthen activities in the civilian sector, e.g., energy, transportation, housing, telecommunications, and so on. These are areas in which the Federal government is <u>not</u> the final customer. Thus, new questions of policy arose as government R&D funding grew during the 1970's. How are priorities to be set in civilian-sector programs? How are results to be transferred and put to use? What economic and market factors are important, and how are they taken into account? How should we assign public rights and private rights to obtain the optimum benefit for society?

*NSF: National Patterns of R&D Resources 1953-1978-79, Table B-5.

These and similar questions were the reasons why science and technology policy became public issues in the 1970's with strong political and economic overtones. Coupled to this was the simultaneous concern with our industrial competitiveness internationally, and the continuing focus on productivity and innovation as factors in our domestic economic growth. Thus, we came to 1980 with a substantial Federal R&D effort related to the civilian sector, and a resolve to improve the effectiveness of these activities.

There is undeniably a new environment today. Perhaps the simplest way to describe this in regard to Federal support for civilian-sector R&D is that, before we consider policy questions concerning effectiveness of a particular program, we are now asking: why? Why should the Federal government fund a given R&D program supporting the civilian-sector? What criteria must be satisfied? What conditions should be established? What limitations or constraints should be set forth for the Federal role?

These questions are obviously called for when Federal funding supports R&D in the private sector. They are equally relevant, though perhaps not as obvious, when Federal funding supports R&D at universities and, indeed, when R&D is conducted within Federal laboratories. The questions relate primarily to the technical areas and objectives of the programs, not simply to the organization which spends the money.

We are, then, in a period of re-examination as to the role of Federal involvement in civilian-sector R&D, the processes by which R&D programs are selected and assigned priorities, and the appropriate interactions between the Federal government and the private sector in these issues. Yet there is general acceptance that there is a constructive and probably necessary, level of R&D effort by the Federal government in specific aspects of civilian-sector objectives. Obviously, a current and continuing debate will focus on what this level should be and for what functions.

It is my purpose here to consider possible answers to these questions as they may affect future activities of the National Bureau of Standards. What opportunities, what obligations, for NBS may emerge from this changing environment, and what pattern might this establish for other government agencies?

To develop some perspective, I would like to return again to the analogy of the central research laboratory of a large, multi-divisional corporation. This was helpful in understanding the functions of NBS and the nature of its technical activities. It can be equally helpful to identify the conditions for establishing new programs, and to specify the relations between NBS and the beneficiary, in particularly, private industry.

The modern multi-divisional corporation will normally include within each division or subsidiary the technical organization necessary to support that unit's current products and processes, and to develop the improved products and processes required in the near future. There are strong interactions among the marketing, manufacturing and technical groups within each operating unit.

How does a central research laboratory in such a corporation interact with the separate product divisions or business units? Consider this from the view of the operating group. What is it that a division or subsidiary expects from the corporate central laboratory? There are several categories of expectations, including:

1. Supply scientific and engineering data and concepts that will strengthen the development and design activities within the divisions.

2. Aid in the solution of ad hoc technical problems for which the central laboratory has special capabilities.

3. Provide the technical basis for new product and process concepts for development and exploitation by business units of the corporation.

The activities that fall in these categories were discussed earlier. The issue now is: How are these activities selected? What initiatives are left to the central laboratory, and what initiatives are taken by the operating divisions? What relations exist during the conduct of the research? What mechanisms are used to transfer and exploit the results, and by whose decisions?

The answers are a bit more complex across the interface of public and private sectors than for the situation within a single corporation. Yet the reasoning is essentially similar since the criteria in both cases are based upon:

1. The need for ultimate conversion of technical change to economic use in society.

2. The desire for long-term health of the technical organizations involved.

The first criterion is served most often by having the dominant decision-making reside with the user, i.e., with the operating business unit. The second criterion is usually satisfied by leaving adequate independence and control of resources within each technical organization, and particularly so for the central laboratory.

The principal thrust of my argument and its analogies can now be stated simply. Within the large corporation, thre is a continuing interplay between the central research laboratory and the operating divisions. In this, the divisions are the primary translators of market and economic pressures into technical needs and/or opportunities that can be addressed by the central laboratory. The central laboratory is usually the initiator of new concepts as well as a bridge to outside science and technology which can be evaluated for economic and business potential in cooperation with the operating units. On the one hand, the central laboratory must have adequate independent functions and flexibility so that it possesses the competence and long-term stability necessary to provide the optimum value for the corporation. On the other hand, it is clear that the specification of what is needed, the decision for proceeding with commercialization of a technical effort, and the management responsibility for transferring and applying technology all reside with the operating divisions.

There are two important qualifications to this over-simplified picture of corporate R&D responsibilities. First, good continuing relations among competent people with mutual respect can result in business concepts emerging from the central laboratory, and technical concepts advancing from the business units. Second, technical programs can initiate within the central laboratory and proceed towards

commercialization without the involvement of existing business units provided the corporate top management approves of this mechanism as a way to enter new businesses or simply as an occasional alternative to a perceived over-conservatism on the part of existing divisional management.

Now consider the analogies on a national scale. In the area of civilian-sector R&D for which the government is not the customer, all Federal R&D agencies together serve as a central research laboratory. The different industry sectors within our economy constitute the "business units" or operating divisions. And the top corporate management which can authorize separate treatment of special cases is, of course, the combined authority of the President and the Congress.

In these terms, let us examine the relations, both current and potential, between NBS and the several industry sectors. The underlying obligations in the field of measurements and standards plus the activities in the basic sciences and engineering necessary for those efforts provide the independence and competence to offer long-term stability. This has already made possible a number of programs in cooperation with industry such as the Visiting Research Associates and certain areas of broad technological support related to building materials and to the dental and medical fields. Activities such as the preparation of Standard Reference Materials are a continuing link with many industry sectors.

The simple observation, as one looks at the growing number of interactions between NBS and industry, is that each such activity was built on the basis of exploration and discussions among all parties in the early stages. This is, as I mentioned, a reasonable requirement in the initiation of new programs within a central laboratory that is of interest to an operating unit, i.e., to a user.

As we proceed through the 1980's, any Federal R&D efforts in the civilian-sector will have to pass the tests of need, of usefulness and of effectiveness. I believe there will be many opportunities for NBS, following the criteria of a central research laboratory, to establish a model in this regard that can set the guidelines for other government agencies.

To give some examples, consider two recent government initiatives that are not going ahead. I refer to the Cooperative Automotive Research Program (CARP) and the Cooperative Generic Technology Program (COGENT). They can provide good lessons for future Federal involvement, drawing upon our analogy with a corporate central research laboratory.

Both programs were motivated by good intentions and advanced by competent people. CARP had its technical structure based on the desire to enlarge the reservoir of basic science and engineering available to a struggling major industry. COGENT was an effort to provide collective resources to broad technologies that could advance the productivity of many industries. Both would strengthen university research.

With the advantage of 20-20 hindsight, these programs omitted a critical step for a central laboratory: they did not have the approval or adequate involvement of the potential users in advance, although the COGENT initiators made serious efforts to do this. Thus, two defects were built into the programs:

1. The problems selected were not necessarily those of highest priority concern to the industries affected, therefore

2. The coupling with, and ultimate transfer to, industrial use were not well-defined, nor was industry exploitation highly probable.

Both difficulties would be minimized automatically if the initiative came from industry. This is not a necessary condition, as competent central laboratories must be encouraged to take initiatives. But initiatives from a central laboratory carry obligations which are understood instinctively in a corporate central laboratory, not always by the Federal government.

I anticipate that programs comparable with COGENT AND CARP will be raised for future considerations as we give continuing thought to strengthening our domestic economy and improving our international competitive position.

My assumptions are:

1. There will be a continuing probe for appropriate government interactions with industry for a variety of economic, political, or national security reasons.

2. The appropriate R&D role for government will probably focus on basic science and engineering in support of selective areas, comparable with present skills and structure of NBS.

3. The National Bureau of Standards is well-accepted by industry as a competent and objective "central laboratory", not associated with a mission-oriented agency, i.e., not part of an "operating unit".

Within the limits of available professional personnel and the relevance of the subject matter, I suggest that NBS can act as the initial interface between government and industry when the value of a particular program is being explored. This can be particularly constructive if in-house government facilities would be involved.

Clearly, NBS can not take on expanded responsibilities with present personnel alone. But I do not anticipate any sudden or continuing activity. I am saying that as the subjects arise naturally, whether in some government agency or industry, there should be a general recognition that NBS should become a party in the earliest of discussions if some direct government R&D involvement is anticipated. Thus, the initial role is that of advisor to insure that the government acts in the role of a central laboratory. This role includes the need to obtain factual inputs and judgments from the industries concerned.

Should the need for an exploratory experimental program arise, the Bureau should be evaluated as a possible first home. I would expect that in most cases the experiment would be terminated after a trial period, or transferred to a more permanenet home as in the case of telecommunications. In other cases, as with building materials research, a longer-term organization emerges, and funds would have to be added to the NBS appropriations or be provided by the agencies or industries interested in the program.

While this can lead to some growth for NBS, I believe it will result mostly in transfer of successful exploratory programs to permanent homes. These could be other government agencies, independent centers, or universities, but would take place after some elements of stability are built in.

Frankly, my principal reason for advocating this often thankless role for NBS is that the greater the interactions with a spread of industries,

the greater the likelihood that reasonable criteria will be developed for such interactions arising from experience and mutual confidence. An indirect benefit may well be the identification of useful additions to the Bureau's on-going activities in measurements and standards as NBS is exposed to industry needs and procedures.

In no way should such interactions subtract from the fundamental NBS missions, or represent more than a modest proportion of total NBS activities, say, 10-15%. As I mentioned earlier, a critical obligation of a constructive central research laboratory is to maintain its own long-term health in order to best work with operating units. Merely responding to requests for service is not in the long-term interests of NBS or the users, public or private.

There is considerably more interaction between industry and some form of national central reserach laboratory in other countries. We can learn much from their operations if indeed NBS does become a principal agent for U.S. government R&D support of the civilian sector. I do not recommend any direct transfer of a mechanism, but this is one area where we may benefit from the experiences, good and bad, that our colleagues in the other industrialized OECD countries have gone through in their own experiments.

The Netherlands, for example, makes use of a non-government agency set up by an Act of Parliament. This is the Organization for Applied Scientific Research (TNO). It has over 1500 professional scientists and engineers, and a total staff of about 5000. Funding is based upon a substantial government subsidy. In 1978, this was about $100,000,000 out of a total operating budget of roughly $171,000,000.* There are several points of interest to us:

1. This Central Organization of TNO receives a substantial part of its operating income from contract research and industrial sponsorship.

2. There are mission-oriented organizations associated with the Central Organization, one of which is the Organization for Industrial Research. It is my understanding that much of their work relates to small or medium size companies. This and other special institutes receive support services from the Central organization.

*European Community - "Organization and Management of Community R&D" - Brussels, February 1980.

3. Each special organization associated with TNO is governed by a Board representing the government, scientists, and the users for whom the work is intended.

In the United Kingdom, the closest organization comparable with NBS is the National Physical Laboratory, which should be considered together with the National Engineering Laboratory. Both come within the Department of Industry, which spent about $220,000,000 on R&D in 1978.* Without going into the complexity of the technical structure within the government departments, there are two items of interest relevant to our discussion:

1. All Departments make some use of a "Customer/Contractor" principle by which the user, public or private, specifies needs, the government laboratory estimates time and costs, and the resulting program is then financed by the user.

2. The Department of Industry has established nine Requirements Boards which develop R&D strategies for government programs related to their areas, and review suggested government programs prior to approval. The areas include chemicals, electronics, clothing and metrology and standards. Each Board has about half its membership from industry, the other half divided between government and academia. The Boards are concerned not only with technical conception and feasibility, but with industrial need, market impacts, effect on industrial competitiveness and foreign trade, and so on.

There are many other examples to think about. West Germany has the unique Max-Planck-Gesellschaft made up of 49 non-university institutes. Their thrust is in fundamental research. However, to promote the use of their research results in industry, this organization set up a company to manufacture instruments called the "Garshing Instrumente GmbH". An important feature of R&D in West Germany is the strong system of interactions among all research groups - government, industry, university, and the major research establishments.

I do not wish to make a summary of all other experiences. The few mentioned show that there are interesting approaches used in other countries to link government resources to industry needs. I recommend that these experiences be reviewed carefully to note the conditions for success, consider whether these would apply to U.S. criteria, and then

*Ibid.

evaluate the possible role of the National Bureau of Standards.

There is one thread running through these examples that relates to the purpose of these hearings. Major research organizations, either within the government or operating on substantial government subsidies, have successfully developed constructive linkages with industry starting from the foundation of a strong scientific and technological base that is independent of any immediate industrial need. As a result, such organizations have tended:

1. To preserve their technical competences and plan for a stable growth.

2. To provide a flexibility and diversity that can meet new technical challenges of industrial growth, and

3. To restrict the extent to which a program might proceed towards commercialization because this would be a diversion from the overall mission and interests of these organizations.

Thus, the mission of NBS not only provides a sound base for involvement with civilian-sector R&D, but it should also act as a self-limiting mechanism. In this sense, the nature of any R&D activities at NBS would not differ in kind because it supports an area of concern to industrial growth as contrasted with concern for the missions of public agencies. The activities are within the scope of technical activities listed in the Organic Act. There is broad flexibility conveyed by Art. 272 authorizing the Secretary of Commerce to undertake these "and similar ones for which need may arise in the operations of Government agencies, scientific institutions, and industrial enterprises".

I believe, therefore, that any programs conducted by NBS which emphasize scientific and engineering support for civilian sector needs are logically within the functions listed by the Organic Act.

Concluding Remarks

I have tried to make a few simple points about the role NBS can play in our changing view of interactions between the public and private sectors.

The Federal government has moved over the years in its R&D activities from strengthening the infrastructure of science and technology to direct support of specific civilian-sector programs. While such interactions will undoubtedly continue, we are currently questioning past programs and attempting to develop criteria by which government efforts can provide proper and needed support without taking on decision-making in areas of industrial competence.

I have proposed that NBS be considered in the planning stages and, if necessary, in providing an initial home for exploratory programs where some collective technical program is considered for the civilian sector. Using the analogy to a corporate central research laboratory interacting with operating business units, I suggested that certain criteria emerge logically, specifically related to the early and continuing involvement of the ultimate user.

A specific recommendation is made to examine the procedures of similar national laboratories in other industrialized countries, most of which have had longer experiences in government - industry interactions along these lines.

Finally, it seems that such actions would be modest extensions of NBS capabilities, and should require no change in the Organic Act.

These are times of change, particularly in our public-private sector relations. In the areas of science and technology policy, a period of exploration, of experimentation may be in order. It is in that spirit that I recommend that NBS take a key role. In a later period, after our experiments are run, some longer-term changes may then be considered. I am looking to minimize uncertainty in a time of change, and this is precisely the contribution that NBS can provide.

Mr. WALGREN. Thank you very much, Dr. Fusfeld.

I think there is a whole thread of disciplined thought running through this that leads to some of the flexibility the Secretary was looking for in terms of changing, reaching out to define a new potential for American industry, and yet, some threads of discipline to limit the conflict that might be created with some of the other institutions in the society—political and otherwise.

I find that really good testimony.

You know more about the Organic Act than I do. My concept of the Organic Act is that it would not really sanction exploratory programs, and yet you feel quite comfortable that it would be within the charter.

Dr. FUSFELD. Yes; but let me clarify that slightly. I do believe my good friend Dr. Ambler is using a relatively broad definition of the activities necessary to carry out "measurements and standards." Frankly, I would like to encourage you to accept that, because that makes life much simpler.

Clearly, in this context, we are using the term "measurements and standards" to cover those procedures, properties, and principles that lie at the base of science and engineering. In that sense, it is reasonable for the Bureau to conduct exploratory programs which provide the technical support base necessary for the continuing evolution of measurements and standards. These activities would stop far short of development work or anything close to commercialization, which Dr. Ambler was very careful to say they do not wish to pursue, quite properly.

The situation that I discussed was based upon the anticipation of other programs coming up comparable to COGENT, which call for some Government collective action—hopefully, in response to industrial initiatives—that might serve as useful constructive activities for the development of such basic procedures and reference materials in areas of broad industrial interest.

When such a program meets the criteria I would like to see—that is, the existence of broad needs, provisions for transferability and so on—then I think the activities could be carried out by the Bureau within this broad concept of basic technical activities helpful for the healthy growth of a particular field. The competency in people and facilities is there.

Thus, I do not really see a major change in the nature of the programs or functions that would call for a change in the Organic Act.

Mr. WALGREN. I realize that Dr. Ambler is using a broad interpretation for the term "measurements and standards," and that we have run into resistence in our attempts to suggest broadening the mission of the agency with more specific orders. I wonder whether it would be useful to specifically broaden the interpretation of the word "standard."

But I am struck by the fact that we need something here that should change in time. And that a very strict constructionist would be literally shocked at the things that are going on in the Bureau of Standards.

Dr. FUSFELD. Mr. Chairman, I think you have just hit upon a possible resolution of the problem. If we were to set down as our understanding a somewhat broader definition of the activities ex-

pected to underlie the countinuing development of "measurements and standards," this would go very far to resolving most of the apparent conflicts that were heard here today. This would no longer require consideration of a change in the Organic Act, at least with regard to activities in pursuit of basic scientific and engineering data.

I do believe that you might find your definition would differ somewhat from the older, more limited version of activity in standards as simply the fabrication and maintenance of a standard meter or something of this sort. However, in terms of standards of performance that Dr. Ambler referred to, standards with regard to properties of materials, and so on, I believe that a somewhat broader statement of necessary and desirable basic technical activities would probably have satisfied every point you heard this morning without changing the act.

Mr. WALGREN. Shouldn't we specifically broaden that definition in the act by changing the act? Not changing the basic thrust of the act, but rather by being clear that we are taking a broader definition of the word "standard," because I am concerned that some extremely restrictive administration may come along and have, literally, the law on their side in terms of restricting the functions of the Bureau.

Dr. FUSFELD. I think you are absolutely correct, although I am not familiar with the legislative procedure in this regard. I think you might provide for a broader definition of activities helpful in the continuing development of measurements and standards, and use language such as "can" or "may," regarding those activities, rather than "must." This would offer the flexibility you are looking for, and avoid potential future problems stemming from a strict, constructionist interpretation or inhibition.

Mr. WALGREN. I would like to have some suggestions about how to broaden that definition without being put in a position of trying to assign or consign ourselves to a larger Government. I would appreciate any further suggestions that you could submit along that line.

Dr. FUSFELD. I will be happy to, in consultation with other colleagues. You may be sure I will not suggest a definition based only on a quick reaction. (See pp. 79–80.)

Mr. WALGREN. Would you develop with me a little bit about how the two Government efforts that you cited, the COGENT and the CARP, broke down, and failed? Where did they develop the resistance that ended them? And how can that be avoided?

Dr. FUSFELD. If I may, let me rephrase that slightly. I do not believe they succeeded in developing the support necessary to advance them. We should therefore look at the problems in their initiation rather than at any barriers in their execution. In all fairness to the programs, there were major elements of potentially constructive activities present, which is exactly why in my testimony I said that I expect programs very comparable to these to come up in the future.

The difficulty that I stated was that, despite the best efforts of people such as those involved in the COGENT program, they really were not able to obtain the enthusiastic participation of a broad spectrum of industry in developing the program. At best, they

achieved a rather mild neutrality, an acceptance based on "Go ahead, and we'll see if we can use the results."

In the CARP program, there was actual opposition in advance, which was never really overcome. I think the moral of the story is simply this: If the Government is going to do something in order to support industry, there must be a deep industry commitment in advance. This must be pursued by working with them in developing the program, determining the needs, and developing commitments as to industry funding, technology transfer, and so on. In other words, each party must become a stakeholder in the process.

That was not accomplished, though not for lack of trying. I do believe that, in the COGENT program, the responsible people tried very, very hard. But the initiative came fundamentally from Government, not industry. And as I said in my testimony, in the central laboratory of a company—and I have directed two —one encourages the central laboratory to take initiatives, but to develop those initiatives very carefully. When the initiative comes from the central laboratory, there is an essential job of selling the user—namely, the operating divisions or subsidiaries—and to get their agreement. When the central laboratory proceeds without the agreement of the potential users—or worse, in the face of their disagreement—then such instances should be rare, and failure even rarer.

Those are the elements that I think were missing in both the COGENT and the CARP programs. These should be looked at very closely in the future for any similar programs.

Mr. WALGREN. You know, it strikes me that the automobile programs were not accepted by the industry at all. In fact, there seemed to be an institutional barrier to their seeing whatever advances could be made, such as high-mileage performance and things like that which are in their interest. It seemed as though the proprietary nature of the automobile industry made them really resist any joint effort.

And I remember we had a bill in this committee that proposed some research in high-mileage engines, and in performance, and the testimony from the auto industry was very clear that they didn't mind if we funded a few professors here and there, but we'd better not put any metal together. This, somehow, was very threatening to them. Do you have any advice as to how you overcome that kind of reaction on the part of private enterprise in our society?

Dr. FUSFELD. In all fairness to my colleagues in the automotive industry, you should go back a bit and review the context in which the CARP program appeared. Remember, it was preceded a year or so before that by a statement from the Secretary of Transportation to the effect that the U.S. Government was going to design the "car of the 1980's." When the storm descended upon that, there was a retreat from the apparent suggestion that Government was going to get into the business of literally designing the components and structure of an automobile, presumably without having to live with the marketing and economic consequences. In a sense, the CARP program was presented as perhaps a way of doing something that would be helpful, but less risky than getting into the design. So you started out with the automotive industry on the defensive, so to

speak, regarding any Government action of a technical nature that might lead to pressures for design changes.

There are a couple of points that can be made from this experience. First of all, the kinds of efforts that are called for in the automotive industry were reasonably within the capabilities of the industry to conduct. Thus, if we consider what the criteria are for appropriate Government involvement, the case for CARP was somewhat different than the case for, say, atomic energy or synthetic fuels. In these areas, one might seriously question whether the total amounts of money could or should be advanced by private corporations.

In addition, the CARP program was perceived as a statement that the U.S. Government in its wisdom should make the decision of when to push particular technologies related to automotive development. And so it appeared to the companies that the Government was setting technical priorities and influencing how the companies should allocate their resources that would be devoted to the more basic science and engineering efforts.

That is quite a different kind of involvement than when the Government supports the basic sciences which the automobile companies may choose to pursue further. This is always acceptable, but not of the highest priority. There is also a difference when the involvement concerns work which is really beyond the financial capabilities of any one company. In this case, the industry may reluctantly have to cooperate and accept a level of participation by the Government, as in the case of synthetic fuels..

I do not believe either of those factors were present in the automotive industry. There may be other industries where they are present. In such cases, I think resistance would melt away, if the industry felt that there was, in fact, a necessary role for the Government. But until that is shown, I do not believe the companies will accept a program where the Government seems to be involved in development, in design, and in manufacture, or even in appearing to set R. & D. priorities.

As I said, industry will normally accept the Government's involvement in supporting our basic technical structure. Here, we must face the fact that such efforts are not an immediate part of their short-term needs, and should not be considered as a mechanism for addressing any current industry problem.

Mr. WALGREN. Could I ask you to expand on the idea in your testimony that responding to requests for service, simply responding to requests for service, is not of a long-term interest of our society?

Dr. FUSFELD. What I had in mind there, and it applies to any laboratory whether public or private, is that a laboratory has to have an area of competence. This is based upon a mission or a charter, and permits the laboratory to pursue that mission and to keep the confidence of people, even if nobody comes to it with any question whatsoever. By developing and exercising that competence, the laboratory becomes of value to the outside world, and people are very likely to call on it for special services related to its competences.

If, on the other hand, you say the mission of a research laboratory, as contrasted with a testing laboratory, is defined as respond-

ing to requests for service, then it would not be able to maintain the sharpness of the skills needed, particularly with regard to new scientific developments. Therefore, as I said, one would not be able to perform the function that the user wants.

I think if you examine the central laboratory of any major corporation, you will find that service requests to it normally make up a limited fraction of the time of the people involved. The bulk of the time is spent on longer term programs, either initiated in the laboratory or agreed to mutually. In this way, unique competences are developed, and others in the corporation then request services related to those competences.

My only point here was to indicate that the great value served by having the Bureau cooperate with outside institutions, and indeed to encourage such cooperation with regard to industrial needs, must never be so distorted as to suggest that the Bureau should initiate programs only in response to outside requests.

Mr. WALGREN. Thank you very much, Dr. Fusfeld. Again, I would like to say that of all the testimony that I have sat through, there is a certain clarity or pursuit of ideas in this that stands out. And I appreciate it very much. On behalf of the committee, we would like to thank you.

Dr. FUSFELD. Well, thank you very much for your comment.

Mr. WALGREN. We will resume at 11 o'clock tomorrow morning.

[Whereupon, at 12:10 p.m., the hearing was adjourned, to reconvene at 11 a.m. on Wednesday, June 17, 1981.]

[Dr. Fusfeld later submitted the following additional analysis in response to the question raised on p. 75.]

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Center for Science and Technology Policy
Herbert I. Fusfeld, *Director*

JUL 6 1981

July 2, 1981

Congressman D. Walgren
Chairman, Subcommittee on Science,
Research and Technology
Committee on Science and Technology
U.S. House of Representatives
Suite 2321 Rayburn House Office Bldg.
Washington, D.C. 20515

Dear Doug:

During my testimony before your Subcommittee on July 16, 1981, the question arose as to whether the range of activities being pursued within the National Bureau of Standards is compatible with the definition of "measurements and standards". You had suggested that questions about this might be resolved by setting forth a broad definition of what the mission entails, and you invited me to address this in a separate letter. This is it.

The specific concept of what constitutes "measurements and standards" is relatively well-understood, it is simply defined by Webster, and it has a traditional acceptance by people engaged in science and engineering. Thus it is probably not reasonable to recommend any substantive changes in definitions.

The situation can probably be approached best by describing in simple, but broad, terms the activities expected at the National Bureau of Standards in order to maintain the capacity for development of "measurements and standards".

Thus, there should be some appropriate point within Section 272 of the Organic Act, or perhaps in legislative material referring to it, at which one could insert the statement:

"It is understood that the National Bureau of Standards will pursue those activities in basic science and basic engineering which are necessary to the continuing development of measurements and standards."

Much of this can be derived from the wording of paragraphs (a), (b), (c) and (d) in Section 272. I am simply freeing the conduct of such activities from dependence upon limiting clauses as "when such data are not to be obtained of sufficient accuracy elsewhere" (Section 272, b).

It appears that the multiple activities of NBS do in fact fall into several categories, all authorized by the present Act or easily legitimatized by the statement suggested above. These categories are:

1. Development of standards of measurement, determination of physical data, development of testing methods, and so on, as listed in Section 272.

2. Development of performance standards that can be used in government procurement when so desired, implied in Section 272 (c) and (d).

3. Basic scientific and engineering activities that can lead to procedures and approaches for new requirements in the development of measurements and standards.

In brief, I do not see any present problem in considering the nature of current NBS activities. New programs based on technical advances or that might be intended to provide support for a broad industrial need can be expected to relate to activities providing the base for developing future measurements and standards.

I trust I have not confused the situation further, and look forward to meeting with you again in the near future.

Best regards.

Sincerely,

Herb

Herbert I. Fusfeld

HIF:lku

REVIEW OF THE NATIONAL BUREAU OF STANDARDS ORGANIC ACT

WEDNESDAY, JUNE 17, 1981

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,
Washington, D.C.

The subcommittee met, pursuant to call at 11:45 a.m., in room 2318, Rayburn House Office Building, Hon. Doug Walgren (chairman of the subcommittee) presiding.

Mr. WALGREN. The hearing will come to order.

I want to apologize for being late, but sometimes it is unavoidable here because of the rules of the House. I appreciate your patience and understanding, and I hope we can go through to the noon hour and accomplish what we intended to do this morning without interfering further with your own schedules. Today is the second day of hearings on the Organic Act of the National Bureau of Standards. The committee is interested in getting views on whether or not there should be changes in the Organic Act to enable the Bureau of Standards to contribute as much as possible to the future of the country both economically and scientifically. Yesterday we heard testimony from Mr. Baldrige, the Secretary of Commerce, and Dr. Ambler, the Director of the Bureau, along with Dr. Fusfeld from New York University.

I want to compliment the gentleman from New Mexico, Mr. Skeen, on his patience and discipline in being here when the Chair is here. Sometimes it is hard to do that so I really appreciate your interest as does the subcommittee as a whole. Would you like to make any opening remarks Mr. Skeen?

Mr. SKEEN. Thank you, Mr. Chairman, I appreciate your sentiments and also I want to add my welcome to the witnesses today. We forgive you because we want you to take care of the business of getting the Democratic Party operational, and we do not mind waiting on the very able chairman. Without further ado I look forward to the testimony today. This is a busy place and we are in and out so do not take offense if we jump up and leave. It is not because we do not like you, it is because something is pressing at the moment. Thank you, Mr. Chairman. I appreciate serving with you.

Mr. WALGREN. You are kind and you are one of the most diligent members engaging in the responsibilities of this committee.

The first witness is William Carey, chairman of the National Bureau of Standards' Visiting Committee. Mr. Carey is also an

executive officer of the American Association for the Advancement of Science. We appreciate your being here Mr. Carey and look forward to your testimony. Your written testimony will be entered in the record. Please proceed as you feel most comfortable in communicating to us your perspective in this area. We look forward to a dialogue with you.

[The biographical sketch of Mr. Carey follows:]

WILLIAM D. CAREY

William D. Carey is Executive Officer of the American Association for the Advancement of Science and Publisher of "Science" and "Science 80" Magazines. Carey came to the Association following six years at Arthur D. Little, Inc., where he was Vice President in charge of the public affairs work of the company. Prior to joining Arthur D. Little, Inc., Mr. Carey was Assistant Director of the U.S. Bureau of the Budget, Executive Office of the President. He was graduated from Columbia University with a Phi Beta Kappa in 1940, received the M.A. in public law and government in 1941 from Columbia, and the M.P.A. in public administration from Harvard in 1942 while a Littauer Fellow.

During his service in the Bureau of the Budget, he headed variously the Atomic Energy Group, the Commerce-Transportation Section, the Labor and Welfare Programs Division, and the Human Resources Programs Division. He was named Executive Assistant to the Director in 1958, and a year later became Executive Assistant Director, the chief career officer of the Bureau. He was in charge of Presidential transition activities in the Bureau during the Eisenhower-Kennedy transition, and in 1966 he was appointed statutory Assistant Director. Since his departure from the government, he has been appointed by the President to the White House Conference on Food, Nutrition and Health, and to the National Advisory Committee on Oceans and the Atmosphere. He was a member of the Science and Technology panel of the President's Science Advisory Committee. He was appointed by the Secretary of Commerce, and served as a member of the Commerce Technical Advisory Board.

He is chairman of the U.S. side of the bilateral group in science policy of the U.S./U.S.S.R. Joint Commission on Scientific and Technological Cooperation. He serves as Chairman of the Statutory Visiting Committee of the National Bureau of Standards, and the Brookings Institution's Advisory Committee on Government Programs. Mr. Carey was a member of the U.S. Steering Committee for the United Nations Conference on Science and Technology for Development and was a member of the U.S. delegation to the Conference. Mr. Carey is a member of the Board of Trustees of the MITRE Corporation and of the Russell Sage Foundation, and he is on the Board of Governors of the Center for Creative Leadership. He is Vice Chairman of the Bio-Energy Council.

Mr. Carey received the Career Service Award of the National Civil Service League in 1958, the Exceptional Service Award of the Director of the Budget Bureau in 1960, the Rockefeller Public Service Award in 1964, and the Edward F. Bartelt Award of the American Cancer Society in 1969.

Mr. Carey is a member of the National Academy of Public Administration, the American Political Science Association, and the American Society for Public Administration. He is a trustee of the Inter-University Program of Case Studies in Public Administration. He is a member of the Institute of Medicine of the National Academy of Sciences.

Mr. Carey served as a member of the National Science Foundation/Association of American Universities Advisory Committee for the "Study of the Future Research Role of Universities," and as a member of the Advisory Board of the Carnegie-Mellon Institute of Research. He has lectured on national policy-making as a professor at the Salzburg Seminar in American Studies. He was a member of the U.S. delegation to O.E.C.D. for the Review of U.S. Science Policy. He was a U.S. participant in the Ditchley Conference on non-profit organizations in 1969. He was a consultant to O.E.C.D. in 1969 on problems of resource allocation for scientific research and development. He participated in 1970 at a multinational conference in Ankara at the request of the Scientific and Technical Research Council of Turkey.

Mr. Carey was a member of the AAAS delegation to the People's Republic of China in November 1978.

STATEMENT OF WILLIAM D. CAREY, CHAIRMAN, NBS VISITING COMMITTEE, AND EXECUTIVE OFFICER, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, WASHINGTON, D.C.

Mr. CAREY. Thank you, Mr. Chairman. Mr. Skeen. As I think you know, under the rotation rules of the Visiting Committee I am sort of a lameduck chairman of the Visiting Committee. My appointment will expire in a few weeks. These 5 years on the Visiting Committee, as I said in my testimony, have not been quiet years. There have been a series of what I call epileptic seizures that have repeatedly overtaken NBS in that short time. They stemmed from changes in command, incoming and departing administrations, budget crises and reorganization and so forth. Yet in spite of this buffeting there is an extraordinary professional and managerial resilience and pride and staying power out there in NBS. I have a great deal of respect for the institution and I value my 5-year term on its Visiting Committee.

The question today has to do with the adequacy of the Bureau's organic statute. I have to say that I see no pressing case for a general overhaul of that statute because it has been serviceable and it has provided sufficient room for the NBS to adapt and modernize. This of course is not always just a function of what the Organic Act says, it is a function of the policy environment within which the Bureau's activities are carried on, and it is a function of the quality and drive of the leadership of the Bureau. The strains that have overtaken NBS and which, in some ways are continuing, do not derive from problems in the Organic Act, in my viewpoint, and I do not think the Organic Act can shield NBS from problems of this kind.

As I have said these problems come from many sources, a proliferation of masters in the executive branch and in the Congress, the collision of budget policies with scientific and technical needs and opportunities, the position of NBS as one unit in the multipurpose Department of Commerce which has to compete for attention and for resources, the low profile of NBS in a period of high profile government and spectacular science, and the general view that has existed that the NBS's resources are just about fully controllable from year to year which I do not believe to be the case at all.

So with all of this the Bureau has had its problems. I think it matters a great deal to NBS, as well as to the organic mission it has, to be able to count on the confidence and support of the top people in the Commerce Department. I must say that recent secretaries have provided that support and concern but have not been able to shield NBS from the strictures and problems of the last several years. I would also say the Visiting Committee during my 5 years has been heard and listened to by the Secretaries of Commerce and in many cases its advice has been taken seriously.

Now in an ideal world it would be great if NBS could pursue science and technology without having to defend itself every few months and rejustify and reprogram, and without being marched to the directions of its many masters, and if it did not have multiple accountability, and so forth. That would be ideal, but as I say, I do not think it is the real world and so the important thing is that Congress and the executive branch ought to have a consensus as to

the asset value that NBS represents and see to it that that asset is conserved very deliberately. The Visiting Committee cannot do that all by itself.

As my statement says, Mr. Chairman, I think that it is helpful to look at NBS from another perspective which is the setting of the general outlook for science and innovation in the coming years and I think NBS is going to be hard put to keep up with what is expected of it. I did some arithmetic which indicates that over the decade of the 1980's, counting both industrial and Federal outlays for research and development, we are talking about a trillion dollar effort. True, that is in current dollars but it is still substantial. I do not think I can remember anything quite like this, particularly in a period of what we call peacetime. On top of the R. & D. there will be massive investments in the industrial sector for productivity-building technology with the help of tax changes and the pressure of defense requirements. So the whole scale putting it all together, is really quite arresting. NBS in my opinion is a strategic unit in the infrastructure that has to support all of this and see to its quality. I would like to think that others in Government like OMB and Congress and the Council of Economic Advisors and others would look carefully to the importance of capacity building at NBS because once NBS falls seriously behind, the catchup problem is going to be very, very difficult and in this predicament, because it is an important part of this infrastructure NBS may act as a brake on the movement of industrial innovation.

Now these are general comments, as I get ready to disappear from the Visiting Committee I will now speak briefly to the draft dicussion bill. The change in section 2 which spells out three basic missions and functions is very sound but I would hope this is intended to express a generic agenda rather than a sequence of priorities that might create problems when you come to budget time. I say it because I think the standards function has strategic importance and I would like to see the language expressly designate the Bureau as having primary responsibility for this mission within the Federal Government. When you get to section 3 I am much less taken with the suggested changes which would bring NBS directly into medicine and the life sciences. These are very large and complex fields of science. They are already supported heavily by government intramurally and extramurally, and to bring NBS into this picture at this late date strikes me as quite questionable.

As to section 4 which speaks on behalf of disabled persons, I find that this strikes a very supportive chord with me, but it is not a function which I think needs to be built into the Organic Act because it could be handled and should be in the biennial authorizing bill. The provision in section 5 on international cooperation seems to me to be a sound, correct kind of updating to legitimize and emphasize the role of the Bureau in contributing to U.S. foreign policy through scientific exchanges and cooperation, a matter on which in other contexts I feel very strongly.

Going to section 8, the language seems OK as far as it goes but I have a notion here that this I think is not fully shared by the people at NBS. This relates to the matter of structuring interagency changes for services that the Bureau performs for them. It

seems to me that when the competence building program is completed and funded some years from now, and it has gone very well and there has been consistency in the way OMB and the Secretary of Commerce have supported the competence building program on an increment-by-increment basis but once the competence building program reaches its target I would like to explore adding a small percentage above cost reimbursement so as to accrue a small fund for what we call Independent Research and Development (IR&D). NBS is providing strong and useful technical services and I think it is reasonable that the Government agencies that benefit from its knowledge should have more responsibility for the enhancement and enrichment of the knowledge base in their own self-interest. I am not suggesting that the bill be changed to run this into it now but I would suggest perhaps that the committee might like GAO to look into the pros and cons of this idea.

When we get to section 9 on research grants and contracts I have some deep doubts about injecting the Bureau into grantsmanship. It has no track record there and from where I sit, I am not speaking of where I sit on the Visiting Committee—the grants business in science these days is bogged down with rules and controls for fiscal accountability and many other things that lead to frictions and nightmares for the granting agencies and the grantees, and bringing one more entry to this confusion I think would not be helpful. I think the suggestion is well meant but I see no evidence that NBS has problems in linking up with academic science and I think we should let well enough alone.

When you come to section 10 and the Visiting Committee I do have a few comments. I am well aware that the Bureau of Standards and possibly the Commerce Department thinks five slots on the Visiting Committee give them enough trouble and maybe a little help. My own view is that a larger membership would be beneficial. While I have been on the Visiting Committee, one member died in midterm suddenly. Another level for a corporate presidency just before he was to become chairman. These discontinuities hurt when you only have a group of five and even if you are lucky and all five hang in for 5 years the rotation annually of one member at a time means it is very slow business to get versatility into the committee. On the other hand I do not much care for the draft language of the bill that divides the proposed committee into three mandated categories. I think we should stay loose on that and not write strictures into the Organic Act which may not suit the day.

As to section 11 proposing authority for new joint research institute and development centers, I am not too clear where I stand on this matter, Mr. Chairman. I know the merit of the generic idea. I am well aware of the arrangements with the University of Colorado that now exist with multiagency support for the astrophysics lab there and more of this might indeed be useful. But I just do not know and I think that rather than say aye or nay to a provision of this kind in a revision of the Organic Act I think we need a more persuasive case to be made for these institutes and centers before making the change in the law even though it may just be an authorizing change. When you consider the very tight rations that are available now to NBS and which probably are going to be just

about as tight over the next several years, I do not see where the resources are coming from to support new relationships and new arrangements of this kind. So my concerns go to the need which I am not clear about and which I do not think has been demonstrated, and to the wherewithal where I am pretty clear.

I guess what I want is to say is that the existing array of laws that relate to the NBS in the Organic Act are quite sufficient for the functioning of the Bureau. I go back to the ups and downs that NBS has been suffering through for the last several years and it seems to me the reasons are quite different from the core legislation. But if the subcommittee nevertheless decides to go ahead and make selected improvements many of them would have my support while others would not. I would say, as a closing comment that if the Organic Act is to be reopened this year or next year I do not think the charter should be silent about the important roles of NBS in the field of ADP and standard reference data both of which are mandated in other laws but they are now settled responsiblities for NBS and integrated parts of its mission.

I think that about does it, Mr. Chairman. I assume you may have some questions.

Mr. WALGREN. Thank you, Mr. Carey.

You indicate that if we do write any new laws or change any laws that they should specifically deal with automatic data processing.

Mr. CAREY. I am saying, Mr. Chairman, that there at least ought to be some attempt to reflect in the Organic Act the existence of these in the two statutes and responsibilities. If you are going to take seriously the comprehensiveness of the Organic Act and regard that as the basis for the mission then I would think at least by cross reference or allusion these other functions should be cited as important and continuing.

I realize there may be some committee jurisdiction problems here but if you are not going to alter the ADP legislation, for example, or the standard reference legislation, then I think that some reference, inclusive reference would be very useful.

Mr. WALGREN. Part of my concern is that future administrations may look at the Organic Act alone and perhaps saw that the Congress may have authorized programs and substantially cut them arbitrarily in a way that would then put the Director of the Bureau in a position where he could not justify the range of the programs that the Bureau was pursuing at the time. In this year particularly I am impressed with how arbitrarily Congress has acted. It seems to me that whatever functions the consensus is that the Bureau should be pursuing, they ought to be mentioned as specifically as possible. In the absence of the Brooks Act, would you be surprised to find the Bureau of Standards doing some of the things that they are now presently doing with computers and machine tools?

Mr. CAREY. I think the Bureau would probably be necessarily involved but in a more marginal, less central way than it is. I think it would deal more with the basic types of work that NBS is addicted to and probably it would never have, without the Brooks Act, have had the ambition to become a central source of expertise and counsel for the Government. I think it would have felt less

responsibility to attempt to take a central role in the movement and modernization and innovation of ADP in the Federal sector. As you know very well, Mr. Chairman, the Brooks Act has never been funded very heavily relative to the requirements and expectations of that act so that there is always a great gap between directive legislation on the one hand and how the budgets all work out in the end. But it was a very ambitious statute and it is still a very ambitious statute. I do not think at all that the Organic Act would have projected NBS into anything like the role that it is carrying out now in the absence of the Brooks Act.

Mr. WALGREN. Do you find yourself in agreement with the concept that the Bureau should remain strictly a research laboratory? That question also applies to the contracting out functions about which you have expressed your reservations.

Mr. CAREY. My feeling about that, Mr. Chairman, is that an institution like the Bureau of Standards from time to time has an identity crisis. It does not quite know who it is, what it is and where it is going because there are so many directions being set for it, so many different expectations being identified for it. I think that the statement that "the Bureau is and must remain a research laboratory" is a very categorical statement. I think that my view is that the Bureau as a research laboratory is a very strong institution. This is where its history is to be found. It is where all its traditions and methods are centered and I think my view is that predominantly it should remain a research laboratory and that to the extent that it becomes something else than that, the "something else" should not be paid for at the expense of the competence and excellence of its research function which is what tends to happen.

Mr. WALGREN. How would you control the competency building or the capacity building that you raise in your presentation? Conceivably how do you decide whether to build capacity in this area or that area?

Mr. CAREY. I think that there, Mr. Chairman, you do need a planning system which does not operate wholly separately from the budgeting, the resource allocation system. It should be a planning process that is open, that is imaginative, that involves industry participation and one that is capable of sorting out major choices as to where NBS's roles might go. The planning process at NBS is relatively recent. I am glad to give OMB some credit for having in effect imposed it on NBS. It is beginning to develop strengths, but there is also the problem that these long range planning activities, as rational as they are, do not connect with the budgetary strategies within which NBS has to try to somehow exist. If Government were to decide that what I have said is right, that NBS is a critical unit of the infrastructure on which the national economy in terms of its industrial productivity and innovation depends and that it is an important contributor to what I call the U.S. technology base, and I think that is the case, then I would think that the logical result is that the Government would want NBS to be at the threshold, at the edge of new and emerging science and indeed technology, and that capacity building would be derived from that kind of a planning process. In other words that the funding of NBS ought to be structured on an investment basis rather than an annual

struggle to retain the footing that is already there and still make a sacrifice to the goals of the economy and frugality. I think there is a collision here and it is a serious one. You have to look at an enterprise like NBS as a target for investment and that is I think the approach that needs to be taken to capacity building. If you do not treat it that way you are not going to build capacity.

Mr. WALGREN. In the laymen's sense of the word, "standards," does not seem to me to reach the concept of investment and being on the cutting edge of science, or allowing for that kind of open, wide-ranging future planning that you seem to realize. I, for one, and I think most others close to the problem, would think it is very important for the Federal Government to have some capacity and some place for that activity to take place. Are you satisfied that the concept of standards is broad enough to allow the Department to develop these capabilities in advance of their being drawn out by the necessity of the present economy?

Mr. CAREY. I think probably that the term "standards" is not very helpful when you are out trying to sell an imaginative, far-reaching, forward-looking, lively technological process of change. It sounds very much like weights and measures and a sort of a deep background role for NBS. But industry knows very well what standards mean. Your major procurement agencies such as Defense know very well what standards mean. They go to control, quality control and product reliability and performance and they are crucial and I think that the constituency that NBS works with and for is not misguided by the term "standards." Whether there is something in the name of NBS that appears to define it as a pokey sort of background operation that is not at the forefront, is not at the edge of technological change and discovery and potential, that may indeed be something of a problem. It is almost more of a social problem than a real one. It seems to me, Mr. Chairman, that it is very important for NBS to be concerned with the potential of advancing science and potential technological change. If NBS is not looking down the road in terms of 10 years, 15, 20 years, which is the time cycle we are all familiar with for innovation to occur, following from fundamental research, then I think that it is missing its duty.

The importance that we have got to attach, I think, to estimating the potential for contributions from science and technology to productivity, competitiveness, defense, all the things on our agenda, is very central and I think that state of mind has to be prominent in the Bureau of Standards and in the agencies which control outcomes for the Bureau of Standards in terms of resources. But if you have a situation going on year after year where the management of the Bureau has to practic defensive management all the time, or 90 percent of the time, the amount of attention that it can give to potential and to leadership, to imagination, to capacity building over the long run, is very, very small. It is a real problem here.

Mr. WALGREN. Does the Organic Act recognize these functions of leadership, advancement of science, potential for technology, for technological change? Does the Organic Act sufficiently direct the attention of the Bureau in that direction?

Mr. CAREY. I think probably it does not in terms of in effect what the preamble of the Organic Act might say. I think that this

concept is not ingrained into the Organic Act. It is to some extent, as you know, expressed in the bill reestablishing the Office of Science and Technology Policy where the Congress a few years ago did express this forward looking potential-oriented view that Government should take of science and technology, but I do not think that there is anything in the immediate statutory vicinity of NBS that brings this point out. It is a point that probably can be or could be emphasized each year or each biennium in the authorizing legislation for NBS. It is a point of view that could be laid down in policy statements from the White House Office of Science and Technology Policy. Somewhere I think it ought to be said and it ought to be said again and again.

Mr. WALGREN. We certainly appreciate that contribution Mr. Carey. The specific comment on the suggested changes are very helpful and we would like to pursue them with you as a committee over the period that I think this process will entail.

Mr. CAREY. I would like to say, Mr. Chairman, even though I have not come up here to cheer for the draft discussion bill, that I think it is an extremely important contribution that this subcommittee is making in providing some visability to the position of the Bureau of Standards. I know my colleagues on the Visiting Committee are grateful and I think that the timing of the hearing in terms of the start up arrangements in the new Administration could not be more felicitious. I am very glad you are doing what you are doing.

[The prepared statement of Mr. Carey follows:]

Testimony of

William D. Carey

Chairman, Statutory Visiting Committee,
National Bureau of Standards

Subcommittee on Science, Research and Technology

June 17, 1981

Mr. Chairman and Members of the Subcommittee:

As you know, under the rotation rule prescribed in the NBS Organic Act, I am in my final year and final weeks as a member of the Statutory Visiting Committee and its Chairman. I am not a scientist. My qualifications are in general government and administration. However, for many years I have had both governmental and private responsibilities bearing on national research and development policies, and it is from that perspective that I will present my views on the roles and missions of the NBS.

I might start by saying that my five years on the Visiting Committee have not been dull. The epileptic seizures that have repeatedly overtaken the Bureau in that short time have been many and unremitting. Changes in command, administrations coming and going, budget crunches, reorganizations, successive inventions of government-wide planning and management rubrics, reprogramming jolts, morale problems, layoffs, personnel ceilings bearing no relationship to either scientific and technical workloads or to scientific potential, identity crises -- yet withal an extraordinary professional and managerial resilience, pride, and endurance -- such has been the experience of the Bureau of Standards, and I have unqualified respect for the institution.

Your point of departure in these hearings, quite reasonably, is the adequacy and scope of the Bureau's organic statute. From my perspective, there is no pressing case for overhauling the statute, because as it has evolved I find it

quite serviceable. It provides sufficient latitude for adaptation and modernization of the Bureau's agenda, always assuming imaginative and prudent leadership coupled with vigilance for quality control and internal balance. The difficulties and strains that affect the Bureau do not arise from faults or gaps in the Organic Act, nor do I think that a statute can provide a shield against them. They spring from a variety of sources: a proliferation of masters in the Executive Branch and the Congress; the inevitable collision of budgetary policies with scientific and technical methods and opportunities; the status of NBS as a competing unit for resources and attention within a multipurpose Department; the traditional low profile of the Bureau in an age of high-profile government and spectacular science; and the perception that as an old-line agency without an energetic constituency the Bureau's resources are almost absolutely controllable and its level-of-effort discretionary from year to year. Given all this, the Bureau's potential contributions to the nation's industrial and technological base tend to be obscured and occasionally trifled with, and I can recall from the distant past an NBS Director facing me at a budget hearing and telling me that he had to practice astrology in order to do astronomy. It matters very much to the NBS and its organic mission to be able to count on the confidence and support of the higher echelons of the Commerce Department, and while this is not to be taken for granted, I am very glad to say that recent Secretaries including Mr. Baldridge have come through admirably. The Visiting Committee, too, during my years of service, has been heard and heeded.

It would be fine, in an ideal world, if the Bureau of Standards could pursue scientific and technological excellence without the torments of continuous self-defense and justification, without being marched to the conflicting and changing directions of its numerous masters, and without multiple accountability. Ideal perhaps, but hardly real. What matters, then, is that there be a consensus

in Congress and in the Executive Branch as to the asset value that the Bureau represents, and that this asset be looked after conscientiously. No Visiting Committee can do that by itself.

If we try to position the Bureau of Standards in a setting of the general outlook for science and innovation in the years ahead, it is my opinion that the Bureau will be strained to its full capacity in meeting both the needs of government and industry. As I do the arithmetic, the aggregate national investment in research and development over the present decade, counting both government's and industry's outlays, will come very close to a trillion dollars. There has never been anything quite like this before, and I believe that it calls for rationalization. If, on top of the R&D, we estimate what will be spent on productivity-building technology, aided by tax incentives and enormous defense requirements, the total scale has to capture and hold our attention. The Bureau of Standards is a strategic component of the infrastructure that must support and enable this prodigious effort, and I would like to think that the OMB, the Council of Economic Advisers, the Congress, and the Commerce Department would recognize the importance of capacity-building at the Bureau. Otherwise, we may find that as the decade wears on, NBS will not be able to satisfy the requirements of a technological economy and that it lags years behind the cutting edge of innovation and competitive leadership. I would hope that the planning efforts under way at the Bureau would reflect these concerns and that they would not be viewed by OMB or Congress as empire-building but as sound capacity-building.

Having let myself go to this extent, reflecting my thoughts as I disappear from the Visiting Committee, I will comment briefly on the draft discussion bill. And I will preface my remarks by saying that I think the Subcommittee has been helped greatly by the GAO and CRS studies of the NBS.

The proposed change in Section 2 of the Organic Act, spelling out three basic missions and functions for the Bureau, is a useful and constructive statement. I assume that the draft intends these three missions to comprise a generic agenda rather than a sequence of priorities that would influence the allocation of resources. I say this because I view the standards function as having strategic importance, and I believe that this perception would be strengthened if the language expressly designated the Bureau as having the "primary responsibility" for this mission within the Federal system.

I am less persuaded as to the wisdom of the changes suggested in Section 3 to the extent that NBS would be brought directly into the field of medicine and the life sciences. These are major fields of science, already supported heavily by the government both intramurally and extramurally, and I do not see what is to be gained by bringing NBS into that picture at this late date.

The provisions to amend Section 4 on behalf of disabled persons strikes a supportive chord with me, but I hardly think that this function needs to be built into the organic act. It can be handled adequately, in my opinion, by the biennial authorizing bill.

The new provision in Section 5, concerning international cooperation, seems to me the correct sort of updating of the organic act to legitimize and emphasize the Bureau's contemporary and growing contribution to U.S. foreign policy goals.

Skipping to Section 6 I have no difficulty with the language as far as it goes. Personally, and here I am in friendly disagreement with the NBS, I would consider going a step farther on the matter of structuring interagency charges. Once the competence-building program is completed and funded, I would want to explore adding a small percentage above cost reimbursement in order to accrue a modest fund for what is widely accepted in government as "independent research

and development," otherwise called IR&D. Industrial and not-for-profit contractors have had this increment added to their fees for decades. If NBS is providing comparable technical services, and doubtless more economically, I think it reasonable that those government agencies which benefit from its knowledge should take a little responsibility for the continual enhancement of that knowledge, in their own self-interest. The Subcommittee may want to ask the GAO to look into the pros and cons of this idea.

Moving on to Section 9, I must express deep doubts as to the wisdom of injecting the Bureau into the grantsmanship business. It has no track record there, to begin with. The granting business these days is bogged down with rules and controls for fiscal accountability that produce frictions and nightmares for agencies and grantees alike, and adding another granting agency to the confusion would be regrettable. I appreciate the good intentions behind the suggestion, but NBS has no problems that I'm aware of in linking up with academic science, and I believe we should let well enough alone.

We come then to Section 10 and the Visiting Committee. While I know that NBS is satisfied with a Committee of five members, my opinion is that a larger contingent would be beneficial. During my own service, one member died in mid-term and another left for a corporate Presidency on the eve of his tour as chairman. When you have such a small group, these discontinuities matter. Moreover, the stately rhythm of the annual rotation of one member means that it is a slow business to introduce versatility into the Committee. But I do not much like the draft language that divides the nine-member Committee into three mandated categories. I prefer flexibility. And I know of no reason to change the present practice of having the member with the longest service handle the chores of the Chairman.

In Section 11 we come to a new authority to set up Joint Research Institutes and Development Centers. There may be some potential merit to this idea, but I have no evidence that NBS is handicapped by the absence of such joint enterprises, and I would want to see a very persuasive case made for them before I cast an approving vote. Considering the tight rations available to NBS now and in the near years, I don't see the financial and other resources to support such relationships. So my concerns go to the need and the wherewithal.

To sum up, I believe that the present array of statutes relating to NBS are quite sufficient to the functioning of the Bureau. To the degree that the organization experiences ups and down, the reasons are quite separate from its core legislation. If the Subcommittee decides to proceed to make selected improvements of the sort we have been discussing, I would support several of them while disagreeing with other provisions of the draft bill in its existing form. It also seems to me that if the organic act is to be reopened, the charter should not be silent regarding the significant roles of NBS in the areas of automatic data processing and standard reference data -- both of which, while mandated under separate laws, are now settled responsibilities of the Bureau of Standards and integral parts of its mission.

That concludes my remarks, Mr. Chairman.

Mr. WALGREN. Thank you very much. On behalf of the committee we would like to express our appreciation and we may be in touch with you as the process goes forward.

Our next witness will be Dr. Willenbrock. So we could expect to get to Mr. Andrews about 1 o'clock. I will be back in 10 minutes at the latest.

[Brief recess.]

Mr. WALGREN. Dr. Willenbrock, we appreciate your being here and making this contribution for the record. Your printed statement will be made a part of the record and if you care to summarize or engage in any kind of a dialog that would be very welcome. Your statement says you are professor of engineering and applied science at Southern Methodist University. Please proceed as you would like.

[The biographical sketch of Dr. Willenbrock follows:]

DR. F. KARL WILLENBROCK

Present: Cecil H. Green Professor of Engineering Southern Methodist University.

Previous universities: Ph. D., Harvard University, 1950. Faculty Member and Associate Dean of Engineering and Applied Physics Harvard University, 1950-67. Professor and Provost of Faculty of Engineering and Applied Science State University of New York, 1967-70. Dean and Professor, School of Engineering Southern Methodist University, 1976-81.

Previous Government: Director, Institute for Applied Technology National Bureau of Standards, 1970-76.

Consultant: Many University, Industry, and Governmental Agencies. Advisory Committee—Directorate of Engineering National Science Foundation, 1979 to present.

Board of directors or trustees: IEEE, ASTM, ECPD. Present: Engineering Index, Southwest Research Institute National Academy of Engineering.

Honors: Fellow—IEEE, ASSS; member—NAE; Department of Commerce Gold Medal.

STATEMENT OF DR. F. KARL WILLENBROCK, PROFESSOR OF ENGINEERING AND APPLIED SCIENCE, SOUTHERN METHODIST UNIVERSITY, DALLAS, TEX.

Dr. WILLENBROCK. Thank you, Mr. Chairman. It certainly is a great pleasure for me to appear before this subcommittee and participate in the review of the Organic Act of the National Bureau of Standards. This subcommittee should be commended for holding hearings on this important topic. The reports written by the General Accounting Office and Congressional Research Service in preparation for these hearings are both noteworthy and should be of great assistance to the committee in its deliberations.

The National Bureau of Standards has made many contributions to the national welfare in the past. It is my conviction that it can make even more in the future.

My testimony today will have two major components. First, I shall address a number of issues raised in the GAO and CRS reports and in the proposed amendments to the Bureau's Organic Act. Then I shall address some of the ways in which NBS might develop its resources in the next several decades.

In the GAO report entitled "Information on the Mission and Functions of the National Bureau of Standards" of April 22, 1981, considerable concern is expressed about the broad mandate in the present Organic Act of the Bureau. In my judgment, this broad mandate is an asset rather than a liability. It presents a challenge

to the management of the Bureau, to its visiting committee, and to the various external evaluation panels which assist the Bureau in its program development, to select among many possibilities those specific areas of science and technology in which the Bureau can make its most valuable contribution to the Nation. It is the prerogative and responsibility of the NBS management to anticipate where the major problems of the future lie and to undertake the research needed to respond to these future needs. There have been notable examples in the past where this function has been brilliantly accomplished by the Bureau staff.

To enable the Bureau to continue this tradition, I strongly endorse the proposed addition to paragraph 272, section 3 of the Organic Act, in which the Bureau's charter is extended to include the life sciences to complement its present capability in the physical sciences and engineering. The recent significant developments in genetic engineering and biotechnology make such a capability overdue.

Because of the breadth of science and technology it is undesirable to be overly specific in the legislation which defines the mission and functions of the Bureau. One approach would be to state what the Bureau should not do. It should not compete with industry or with universities. But it should carry on activities which these sectors cannot or do not do well. Thus, an active role in the development of the science and technology of measurement is and will continue to be an appropriate focal point for much of the Bureau's activities. However, it would unduly limit the potential value of the Bureau to the Nation if its only activities were in the field of metrology. Its capabilities are much broader. The phrase used in the proposed addition to the Organic Act, section 2, paragraph 271, "enhancing the technological and scientific base of the Nation's industrial capability" points toward this broader mission which the Bureau can effectively carry out.

However, while not duplicating the strengths of industry and universities, the Bureau should improve its technique for working with these sectors of the science and technology communities. The activities of industry, universities, and governmental agencies should be closely coupled in order to maximize the rate of technical progress.

The Bureau has in being two highly successful programs with universities. One is the Joint Institute for Laboratory Astrophysics with the University of Colorado at Boulder, and the second is the funding of external, primarily university-based research by the Center for Fire Research. These two effective programs point to the possible development of even stronger academic ties through which the Bureau could gain increased strength. The universities in the United States are the primary performers of basic research and generally deserve their reputation for being able to carry on basic research in many fields of higher quality at lower cost than other organizations. It is my judgment that the Bureau should capitalize on its experience in these two programs and couple its activities even more strongly with the university sector in the future.

Let me cite a specific example. Due to budgetary and personnel ceiling limitations, the Bureau's Center for Building Technology is being reduced in personnel by approximately one-third. This center

has been the Nation's most comprehensive, single research group in building science and technology, an area which is in great need of more research. Building construction is a major industry, and its rate of technological advance has been relatively slow. In reducing the size of the Bureau's program, many of the areas, such as building economics and design research, in which sizable gains in productivity could be made are being eliminated. One alternative would be for the Center to undertake a program in these areas in conjunction with the university sector. Fortunately, the university sector has recently formed the Architectural Research Centers Consortium, which is comprised of about 20 of the leading research-oriented schools of architecture in the United States. These architecture schools and the related schools of engineering have in existence combined resources far in excess of any other group or organization for research in building science and technology. They also have ready access to the many academic disciplines needed for research in the building process. If the Center for Building Technology developed a comprehensive research program in cooperation with this Consortium, the Bureau would be able to play the crucial role of linking the research output from these universities to the standards-writing organizations and building code groups which control the introduction of new technology into the building process. The potential benefit to the country, to the university participants, and to the Bureau could be very great if such an alliance were formed.

This is one of several possible examples of how the Bureau could extend the impact of its programs through a stronger tie to the university sector. For this reason I strongly endorse the proposed addition to section 11 of paragraph 278 of the Organic Act, which would empower the Bureau to establish joint university research institutes on a systematic basis.

Another proposed modification to the Organic Act which I endorse is the proposed modification of section 10 of paragraph 278 which would enlarge the Visiting Committee to nine members and broaden its functions. The Visiting Committee should help to determine the direction and nature of the NBS program. It should make critical assessments of NBS activities and assist the Bureau in the difficult task of setting priorities among its many programs. The broad mandate which the Bureau's Organic Act provides will be beneficial only if the Bureau's management has high-quality external advice from a Visiting Committee which is actively involved in the development of Bureau programs and is broadly representative of the science and technology community. However, it would be a mistake to restrict the qualifications of the members of the Visiting Committee too specifically. It would be desirable to appoint individuals from the industrial, academic, and not-for-profit sectors who are broadly knowledgeable about scientific and engineering research, technological developments, and the related public policy issues. These members could also serve as a link between the Bureau and the professional and trade associations which play such an important role in the scientific and technological developments in the United States. The Visiting Committee should have a powerful voice in the determination of Bureau programs, and it should also be a powerful voice in support of Bureau activities,

both within the Federal establishment and throughout the science and technology community.

A specific topic raised in the CRS study which reviewed the operations of NBS from 1971 to 1980 is in the area of computers. The Bureau has had the responsibilities assigned by the Brooks Act since 1965. The rapid advances in computer technology within the past 15 years have made the rigid structure prescribed by this act for the Government purchase of computers largely anachronistic. It has led to the purchase rather than lease of computing equipment and did not anticipate the rapid development and use of minicomputers and microprocessors. At NBS the focus on automatic data processing standards has hindered the development of a broad research capability in computer science and engineering. It has also become increasingly evident that the Federal Government is at present not a cost-effective user of computer-based information technology, and much of its data processing operations are both costly and obsolete. It would thus appear that fundamental changes in how Government agencies procure and use computers are necessary. Some of the issues related to the Federal Government's use of computers are explored in the National Academy report "Computers, Communications, and Public Policy," published in 1981. If the Bureau were relieved of the responsibility of developing ADP standards, it could develop the general computer competence needed to improve the Federal Government's ability to use contemporary computer technology effectively.

My next comments are directed toward some of the broad directions in which NBS should seek to develop its resources over the next several decades. The U.S. position with regard to scientific research is very strong at present; however, its technological capability is being very successfully challenged by countries such as Japan and West Germany. Although technological capability in many fields is directly related to scientific achievements, it is even more strongly related to engineering capability. In a number of critical fields of engineering, foreign industrial competitors are outdistancing the United States. Japan's ability to outproduce the United States in steel and automobiles has been clearly and to many U.S. companies painfully demonstrated. With Japan producing annually more baccalaureate-level electrical engineers than the United States by one-third, there is a deep concern in the American electronics industry that an increasing percentage of the electronics and computer fields will soon be taken over.

Engineering educators and industrial leaders are very concerned about the quality and quantity of this Nation's engineering talent. Indeed, many feel that the U.S. response to the challenge being presented to our technological leadership should be similar to the U.S. response when the U.S.S.R. launched the first Sputnik. There should be a clear national recognition that technological leadership is essential to this Nation and that appropriate steps must be taken to insure that the United States is not being pushed out of the front rank among the technologically advanced nations of the world. While some of the actions which should be taken, such as the strengthening of engineering colleges and improving the quality and increasing the quantity of American engineering graduates, are outside the scope of present NBS activities, it is important to

examine what NBS might contribute to strengthen the Nation's technological capability.

There are many branches of technology in which the advances in the state of the art have been far too slow in the United States in comparisons with other nations. Foreign industrial competitors are progressing more rapidly. One of the Nation's most obvious failures has been in the field of manufacturing processes, factory automation, and robotics. It is of interest to examine the Bureau's activities in the area. In the early 1970's the Bureau started a small program in robotics. However, it was inadequately funded and did not make a significant addition to U.S. progress. In 1978, organizational changes at the Bureau resulted in the formation of the National Engineering Laboratory and the creation of a number of new centers including a Center for Manufacturing Engineering. This Center has launched a comprehensive program in factory automation and robotics. The Center is also in the process of automating the NBS machine shop, which is of an adequate size and scope to provide an effective test bed for solving problems involved with the integration of batch manufacturing processes. It is developing improved methodology and standards.

The Bureau program relates appropriately to other Federal programs. It complements the individual automation research projects which the National Science Foundation has been funding for a number of years in universities and not-for-profit organizations. It has a broader conceptual base than the much larger Department of Defense's integrated computer-aided manufacturing (ICAM) program. This program is focused on the aerospace industry with a major thrust on sheet metal manufacturing processes. This case is an example of NBS finally establishing a program of sufficient scope to be able to contribute effectively to a technological area in which the Japanese, in particular, have far outdistanced the United States. It is perhaps of value to speculate about what the present situation would be if the project started in the early 1970's had been adequately recognized and funded. It is possible that the U.S. position in factory automation would be far different from what it is today. The U.S. lag in factory automation is one of the factors which has led to the present situation in which Japanese automobile manufacturers have competed so sucessfully with U.S. manufacturers in both the U.S. domestic and international markets.

I recently had a conversation with an engineer from one of the major Detroit automotive companies who said the Japanese can deliver a car in Detroit for $1,500 less than the U.S. manufacturer can make a comparable car. Factory automation is one of the major factors in production costs.

However, there are many difficult problems to be solved if NBS wishes to increase its contributions to U.S. technological capability. It must select its areas of activity with great wisdom and then must concentrate enough resources so that its efforts are above critical size. Of particular difficulty will be fields in which there is very rapid technological progress due to the presence of a number of strong, technologically advanced companies. In fields such as computers and large-scale integrated electronic circuits, Government laboratories find themselves in a similar position to universi-

ties. It is extremely difficult to maintain facilities at the state of the art since the capital investments are very high and advances in the development of new equipment are very rapid.

Another problem is the salary levels paid for top-quality engineers with expertise in these areas. Industrial salaries are beyond those available in the Government service and at most universities. The most competent individuals with Ph. D.'s in electronics and computers cannot be hired for the starting salaries presently offered for new Ph. D.'s in the civil service. The present salary ceiling for the civil service will also prevent the Bureau from being able to hire or retain experienced professionals in such technologically active fields. Neither the Bureau nor most universities can compete in the free market, which determines the salary levels of such professionals. Since more than three-fourths of the engineers in the United States work for industries, it is clear that the industrial salary scales are those which will dominate the marketplace. If other organizations cannot meet these salary scales, they can only attract the less qualified people in the long term.

However, if it is assumed that such problems as salary levels and adequate capital equipment are solvable in the long term, it will be worth while to consider means by which NBS can work more closely with the industrial sector, since most of the Nation's technological activities are focused in industry. Here the best approach is not clear. Some experimentation would be worth undertaking, since the potential benefits are large.

In considering how to undertake a program in developing technology, it is probable that developing working relations with an industrial consortium rather than with an individual company will be most effective. The pressures on a single company to seek to capture the advantages of a technological advance for its private benefit are high. In addition, the fluctuations in the marketplace make it difficult for many companies to keep long-term commitments to contribute significant resources to programs for which payoffs are uncertain in both time and commercial value. Yet it may well be that investing in such programs is exactly what needs to be done for the United States to gain technological leadership. If marketplace forces are the only determining factors, the United States will clearly underinvest in technological areas for which payoffs can not be expected in less than the time frame of a decade. The U.S. space program would never have been launched on the basis of free marketplace considerations.

It is also evident that areas selected for development should most probably be problem-focused rather than oriented toward a specific discipline. The natural organizational structures in universities are along disciplinary lines, and universities function most effectively when the mixing of disciplines is not required. For development of new technology the mixing of individuals with a variety of disciplines is the most appropriate. The Bureau has at present both disciplinary and problem-focused technical programs, but it would need to build increasing competence in problem-focused programs in order to increase its technological contributions.

It could be very valuable to the Nation if the Bureau devoted some of its competence building program resources to strengthening its staff in fields of future technological importance. The selec-

tion of such fields and the direction of the program development will not be easy. It will require a much more intimate working relation with the industrial sector than presently exists. However, it could be one means for the United States to develop greater cooperation between the public and private sectors in the strengthening of the Nation's technological capability. The Bureau's generally good relations with industry is a distinct asset.

In highlighting some of the problems associated with the possibility of increased activity by the Bureau in technologically important areas, I do not wish to leave the subcommittee with the impression that such activities are not appropriate for the Bureau and that the Bureau should focus its entire efforts on metrology and standards development. While the Bureau's capability in metrology and standards should be maintained, this capability should be complemented by an increasing emphasis on technological development.

The Nation's economic health, national defense, and quality of life are all strongly dependent on the Nation's technological capability. This capability is in no sense static but depends on a steady growth in technological knowledge and ability to improve and use technology effectively. For NBS to contribute more to this knowledge base will require a well-informed management and professional staff, a broadly based and active visiting committee and external evaluation panel system. It will also require willingness on the part of the Bureau management, the Department of Commerce, and the Office of Management and Budget to undertake forward-looking programs in those areas which are important to the Nation's future. If I may borrow one of Mr. Carey's terms, the Nation should be investing in the future by strengthening the Bureau's capability.

Mr. Chairman, your invitation to participate in these hearings is much appreciated. I shall be happy to respond to any questions you or members of the subcommittee staff may wish to ask.

Thank you for your attention.

[The prepared statement of Dr. Willenbrock follows:]

HEARINGS ON
ORGANIC ACT OF THE NATIONAL BUREAU OF STANDARDS
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND TECHNOLOGY
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

TESTIMONY OF

P. KARL WILLENBROCK
CECIL H. GREEN PROFESSOR OF ENGINEERING
SOUTHERN METHODIST UNIVERSITY

JUNE 17, 1981

It is a great pleasure for me to appear before this Subcommittee and participate in the review of the Organic Act of the National Bureau of Standards. This Subcommittee should be commended for holding hearings on this important topic. The reports written by the General Accounting Office and Congressional Research Service in preparation for these hearings are both noteworthy and should be of great assistance to the Committee in its deliberations.

The National Bureau of Standards has made many contributions to the national welfare in the past. It is my conviction that it can make even more in the future.

My testimony today will have two major components. First, I shall address a number of issues raised in the GAO and CRS reports and in the proposed amendments to the Bureau's Organic Act. Then I shall address some of the ways in which NBS might develop its resources in the next several decades.

In the GAO report entitled "Information on the Mission and Functions of the National Bureau of Standards" of April 22, 1981, considerable concern is expressed about the broad mandate in the present Organic Act of the Bureau. In my judgment, this broad mandate is an asset rather than a liability. It presents a challenge to the management of the Bureau, to its Visiting Committee, and to the various external evaluation panels which assist the Bureau in its program development, to select among many possibilities those specific areas of science and technology in which the Bureau can make its most valuable contribution to the nation. It is the prerogative and responsibility of the NBS management to anticipate where the major problems of the future lie and to undertake the research needed to respond to these future needs. There have been notable examples in the past where this function has been brilliantly accomplished by the Bureau staff.

To enable the Bureau to continue this tradition, I strongly endorse the proposed addition to Paragraph 272, Section 3 of the Organic Act, in which the Bureau's charter is extended to include the life sciences to complement its present capability in the physical sciences and engineering. The exciting current developments in genetic engineering and biotechnology make such a capability rewarding.

Because of the breadth of science and technology it is undesirable to be overly specific in the legislation which defines the mission and functions of the Bureau. One approach would be to state what the Bureau should not do. It should not compete with industry or with universities. But it should carry on activities which these sectors cannot or do not do well. Thus, an active role in the development of the science and technology of measurement is and will continue to be an appropriate focal point for much of the Bureau's activities. However, it would unduly limit the potential value of the Bureau to the nation if its only activities were in the field of metrology. Its capabilities are much broader. The phrase used in the proposed addition to the Organic Act, Section 2, Paragraph 271, "enhancing the technological and scientific base of the nation's industrial capability" points toward this broader mission which the Bureau can effectively carry out.

However, while not duplicating the strengths of industry and universities, the Bureau should improve its techniques for working with these sectors of the science and technology communities. The activities of industry, universities, and governmental agencies should be closely coupled in order to maximize the rate of technical progress.

The Bureau has in being two highly successful programs with universities. One is the Joint Institute for Laboratory Astrophysics with the University of Colorado at Boulder, and the second is the funding of external, primarily university-based research by the Center for Fire Research. These two effective programs point to the possible development of even stronger academic ties through which the Bureau could gain increased strength. The universities in the United States are the primary performers of basic research and generally deserve their reputation for being able to carry on basic research in many fields of higher quality at lower cost than other organizations. It is my judgment that the Bureau should capitalize on its experience in these two programs and couple its activities even more strongly with the university sector in the future.

Let me cite a specific example. Due to budgetary and personnel ceiling limitations, the Bureau's Center for Building Technology is being reduced in personnel by approximately one-third. This Center has been the nation's most comprehensive, single research group in building science and technology, an area which

is in great need of more research. Building construction is a major industry, and its rate of technological advance has been relatively slow. In reducing the size of the Bureau's program, many of the areas, such as building economics and design research, in which sizable gains in productivity could be made are being eliminated. One alternative would be for the Center to undertake a program in these areas in conjunction with the university sector. Fortunately, the university sector has recently formed the Architectural Research Centers Consortium, which is comprised of about twenty of the leading research-oriented schools of architecture in the U.S. These schools and the related schools of engineering have in existence combined resources far in excess of any other group or organization for research in building science and technology. They also have ready access to the many academic disciplines needed for research in the building process. If the Center of Building Technology developed a comprehensive research program in cooperation with this Consortium, the Bureau would be able to play the crucial role of linking the research output from these universities to the standards-writing organizations and building code groups which control the introduction of new technology into the building process. The potential benefit to the country, to the university participants, and to the Bureau could be very great if such an alliance were formed.

This is one of several possible examples of how the Bureau could extend the impact of its programs through a stronger tie to the university sector. For this reason I strongly endorse the proposed addition to Section 11 of Paragraph 278 of the Organic Act, which would empower the Bureau to establish joint university research institutes on a systematic basis.

Another proposed modification to the Organic Act which I endorse is the proposed modification of Section 10 of Paragraph 278 which would enlarge the Visiting Committee to nine members and broaden its functions. The Visiting Committee should help to determine the direction and nature of the NBS program. It should make critical assessments of NBS activities and assist the Bureau in the difficult task of setting priorities among its many programs. The broad mandate which the Bureau's Organic Act provides will be beneficial only if the Bureau's management has high-quality external advice from a Visiting Committee which is actively involved in the development of Bureau programs and is broadly representative of the science and technology community. It would be a mistake to restrict the qualifications of the members of the Visiting Committee too specifically. It would be most desirable to appoint individuals from the industrial, academic, and not-for-profit sectors who are broadly knowledgeable about scientific and engineering research, technological developments, and the related public policy issues. These members could also serve as a link between the Bureau and the professional and trade associations which play such an important role in the scientific and technological developments in the U.S. The Visiting Committee should have a powerful voice in the determination of Bureau programs, and it should also be a powerful voice

in support of Bureau activities, both within the federal establishment and throughout the science and technology community.

A specific topic raised in the CRS study which reviewed the operations of NBS from 1971 to 1980 is in the area of computers. The Bureau has had the responsibilities assigned by the Brooks Act since 1965. The rapid advances in computer technology within the past fifteen years have made the rigid structure prescribed by this Act for the government purchase of computers largely anachronistic. It has led to the purchase rather than lease of computing equipment and did not anticipate the rapid development and use of minicomputers and microprocessors. At NBS the focus on automatic data processing standards has hindered the development of a broad research capability in computer science and engineering. It has also become increasingly evident that the federal government is at present not a cost-effective user of computer-based information technology, and much of its data processing operations are both costly and obsolete. It would thus appear that fundamental changes in how government agencies procure and use computers are necessary. Some of the issues related to the federal government's use of computers are explored in National Academy report "Computers, Communications, and Public Policy," published in 1981. If the Bureau were relieved of the responsibility of developing ADP standards, it could develop the general computer competence needed to improve the federal government's ability to use contemporary computer technology effectively.

My next comments are directed toward some of the broad directions in which NBS should seek to develop its resources over the next several decades. The U.S. position with regard to scientific research is very strong at present; however, its technological capability is being very successfully challenged by countries such as Japan and West Germany. Although technological capability in many fields is directly related to scientific achievements, it is even more strongly related to engineering capability. In a number of critical fields of engineering, foreign industrial competitors are outdistancing the U.S. Japan's ability to outproduce the U.S. in steel and automobiles has been clearly and to many U.S. companies painfully demonstrated. With Japan producing annually more baccalaureate-level electrical engineers than the U.S. by one-third, there is a deep concern in the American electronics industry that an increasing percentage of the electronics and computer fields will soon be taken over.

Engineering educators and industrial leaders are deeply concerned about the quality and quantity of this nation's engineering talent. Indeed, many feel that the U.S. response to the challenge being presented to our technological leadership should be similar to the U.S. response when the USSR launched the first Sputnik. There should be a clear national recognition that technological leadership is essential to this nation and that appropriate steps must be taken to ensure that the U.S. is not being pushed out of the front rank among the technologically advanced nations

of the world. While some of the actions which should be taken, such as the strengthening of engineering colleges and improving the quality and quantity of American engineering graduates, are outside the scope of present NBS activities, it is important to examine what NBS might contribute to strengthen the nation's technological capability.

There are many branches of technology in which the advances in the state of the art have been far too slow in the U.S. in comparison with other nations. Foreign industrial competitors are progressing more rapidly. One of the nation's most obvious failures has been in the field of manufacturing processes, factory automation, and robotics. It is of interest to examine the Bureau's activities in this area. In the early 1970s the Bureau started a small program in robotics. However, it was inadequately funded and did not make a significant addition to U.S. progress. In 1978, organizational changes at the Bureau resulted in the formation of the National Engineering Laboratory and the creation of a number of new centers including a Center for Manufacturing Engineering. This Center has launched a comprehensive program in factory automation and robotics. The Center is also in the process of automating the NBS machine shop, which is of an adequate size and scope to provide an effective test bed for solving problems involved with the integration of batch manufacturing processes. It is developing improved metrology and standards. The Bureau program relates appropriately to other federal programs. It complements the individual automation research projects which the National Science Foundation has been funding for a number of years in universities and not-for-profit organizations. It has a broader conceptual base than the much larger Department of Defense's Integrated Computer-Aided Manufacturing (ICAM) program. This program is focused on the aerospace industry with a major thrust on sheet metal manufacturing processes. In this case we have an example of NBS finally establishing a program of sufficient scope to be able to contribute effectively to a technological area in which the Japanese, in particular, have far outdistanced the U.S. It is perhaps of value to speculate about what the present situation would be if the project started in the early 1970s had been adequately recognized and funded. It is possible that the U.S. position in factory automation would be far different from what it is today. The U.S. lag in factory automation is one of the factors which has led us to the present situation in which Japanese automobile manufacturers have competed so successfully with U.S. manufacturers in the U.S. domestic market and globally.

However, there are many difficult problems to be solved if NBS wishes to increase its contributions to U.S. technological capability. It must select its areas of activity with great wisdom and then must concentrate enough resources so that its efforts are not subcritical in size. Of particular difficulty will be fields in which there is very rapid technological progress due to the presence of a number of strong, technologically advanced companies. In fields such as computers and large-scale integrated circuits, government laboratories find themselves in a similar position to

universities. It is extremely difficult to maintain facilities at the state of the art since the capital investments are very high and advances in the development of new equipment are very rapid.

Also, the salary levels for top-quality engineers with expertise in these areas are beyond those available in the government service and at most universities. The most competent individuals with Ph.D.'s in electronics and computers cannot be hired for the starting salaries presently offered for new Ph.D.'s in the Civil Service. The present salary ceiling for the Civil Service will also prevent the Bureau from being able to hire or retain experienced professionals in such technologically active fields. Neither the Bureau nor most universities can compete in the free-market, which determines the salary levels of such professionals. Since more than three-fourths of the engineers in the U.S. work for industries, it is clear that the industrial salary scales are those which will dominate the marketplace. If other organizations cannot meet these salary scales, they can attract only less qualified people in the long term.

However, if it is assumed that such problems as salary levels and adequate capital equipment are solvable in the long term, it will be worthwhile to consider means by which NBS can work more closely with the industrial sector, since most of the nation's technological activities are focused in industry. Here the best approach is not clear. Some experimentation would be worth undertaking, since the potential benefits are large.

In considering how to undertake a program in developing technology, it is probable that developing working relations with an industrial consortium rather than with an individual company will be most effective. The pressures on a single company to seek to capture the advantages of a technological advance for its private benefit are high. In addition, the fluctuations in the marketplace make it difficult for many companies to keep long-term commitments to contribute significant resources to programs for which payoffs are uncertain in both time and commercial value. Yet it may well be that investing in such programs is exactly what needs to be done for the U.S. to gain technological leadership. If marketplace forces are the only determining factors, the U.S. will clearly underinvest in technological areas for which payoffs can be expected within the time frame of a decade although other technologically advanced countries do so. The U.S. space program would never have been launched on the basis of free marketplace considerations.

It is also evident that areas selected for development would most probably be problem-focused rather than oriented toward a specific discipline. The natural organizational structures in universities are along disciplinary lines, and they function most effectively when the mixing of disciplines is not required. For development of new technology the mixing of individuals with a variety of disciplines is the most appropriate. The Bureau has

at present both disciplinary and problem-focused technical programs, but it would need to build increasing competence in problem-focused programs in order to increase its technological contributions.

It could be very valuable to the nation if the Bureau devoted some of its Competence Building program resources to the development of technical fields of future technological importance. The selection of such fields and the direction of the program development will not be easy. It will require a much more intimate working relation with the industrial sector than presently exists. However, it could be one means for the U.S. to develop greater cooperation between the public and private sectors in the strengthening of the nation's technological capability. The Bureau's generally good relations with industry is a distinct asset.

In highlighting some of the problems associated with the possibility of increased activity by the Bureau in technologically important areas, I do not wish to leave the Subcommittee with the impression that such activities are not appropriate for the Bureau and that the Bureau should focus its entire efforts on metrology and standards development. While the Bureau's capability in metrology and standards should be maintained, this capability should be complemented by an increasing emphasis on technological development.

The nation's economic health, national defense, and quality of life are all strongly dependent on the nation's technological capability. This capability is in no sense static but depends on a steady growth in technological knowledge and ability to improve and use technology effectively. For NBS to contribute more to this knowledge base will require a well-informed management and professional staff, a broadly based and active Visiting Committee and evaluation panel system. It will also require willingness on the part of the Bureau management, the Department of Commerce, and the Office of Management and Budget to undertake forward-looking programs in those areas which are important to the nation's future. It is my hope that they will do so.

Mr. Chairman, your invitation to participate in these hearings is much appreciated. I shall be happy to respond to any questions you or members of the Subcommittee may wish to ask.

Thank you for your attention.

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Mr. WALGREN. We appreciate that very much.

I am looking for suggestions to broaden the charter of the Bureau, and I wonder if the word investment might not play a role. You mentioned broadening the Bureau's technological and scientific base and that has already been suggested. What I am saying is that I invite you to make suggestions that do not violate the political current that is now running and yet would guide the Bureau and allow it to take the directions that we think future events might lead it to recognize and properly pursue. Secretary Baldrige was looking for ways to guide our efforts into specializing in areas where we may have a competitive advantage in the world. He raised the point you made about the need to direct our technological development into areas where we really might have special advantages. Your thought of industry consortiums of some kind might be simple contact to the Bureau. It certainly goes to that direction. I think the model of Japan and the way they directed their efforts toward computer electronics and the automobile is a striking example of the potential in that area.

Dr. WILLENBROCK. I agree it would be a tough job to make the right selections but the Japanese have shown it can be done. We have done it in the past so it is not impossible.

Mr. WALGREN. You are clear in your recognition that the marketplace itself is not totally sufficient. Our problem is that political forces often want to emphasize only the marketplace alone because that is where the near term interest of specific groups or specific financial interests might be. Yet clearly the marketplace alone is not enough and somehow or other we have to bring some larger direction to our efforts.

Dr. WILLENBROCK. I have heard the marketplace described recently by someone knowledgeable in the science and technology area as an excellent forum for the auction of present capabilities but a poor predictor of the future. It does a good job of telling you what you should do under the present circumstances but it does not do a good job of longer term predictions. The marketplace did not tell the United States to get into the space program but the benefits of the space program are very evident.

Mr. WALGREN. Is there anything in the Organic Act that covers our interest in the future. The word "investment" does have a future component to it. Simply enhancing science does not cover that directly. I would like to ask you for some ways in future submissions to the committee, in which we could direct the agency toward the future without running into the stone walls of political resistance.

Dr. WILLENBROCK. That is an interesting challenge, Mr. Chairman. I think you have to avoid the word "planning."

Mr. WALGREN. I am interested in your specific recognition of the life science component. The other witnesses perhaps for a combination of reasons resisted enumerating the life sciences. Perhaps we are reciting enumeration of categories but certainly that area is one in which it would seem to me that there may be more need for standards than in many other areas.

Dr. WILLENBROCK. I agree, Mr. Chairman. The point that impressed me is that biological sciences are increasingly using the techniques that physicists and chemists use. They use much of the

same instrumentation and data. Their need for measurement technology, their need for evaluated data with good quality control, and extensive data bases is equivalent to what the physicists, chemists, and engineers need. There is a role for the Bureau in this field although I agree with Bill Carey's remark that NBS should not try to duplicate the National Institutes of Health. There is a Bureau role in the life sciences.

Mr. WALGREN. How do you feel about the concept of the Bureau being able to enter into grants with universities? I suppose it is a form of contracting out, is it not?

Dr. WILLENBROCK. Yes, it is. When I was a member of the Bureau staff, I was involved with the transfer of the fire research program from the NSF RANN program to NBS. The results have been excellent. Before the transfer NBS had worked closely with the NSF program manager who had effectively started the creation of a university capability in fire safety research. Previously there had been practically no work going on. The NSF program created a university fire program which involved good faculty members, good graduate students, and good research. The NBS Center for Fire Research has taken over that program and manages both an in-house program and an externally funded program. Both of them have been strengthened in the process of doing so. The Bureau staff in this area is well connected to the university community. They have a good and healthy relationship.

I think it is an excellent model which could happen in some other areas. I cited as a specific example building technology, but there are other areas in which there could be a real benefit. The Bureau is more isolated than it ought to be. Strong ties to the university sector would be very beneficial. As the particular case of fire safety research shows, when the program is well managed the results can be very positive. However, I agree with Mr. Carey's remarks, that NBS should not turn into another NSF. They have different characters. However, the ability of NBS to develop university grant programs on a selected basis would be a valuable addition. The JILA program and fire research program are both very active and very fruitful.

Mr. WALGREN. Do they now have the ability to contract out?

Dr. WILLENBROCK. They have the authority but do not frequently use the capability. One of the merits of adding the authority in the Organic Act is it gives a clear legislative base for university-based programs..

Mr. WALGREN. Thank you very much Dr. Willenbrock. We appreciate your contribution to this discussion. We look forward to further dialogue with you as we go along.

The last witness today is Sydney D. Andrews, director of division of standards of the Florida Department of Agriculture. Mr. Andrews is also chairman of the board of the American Society for Testing Materials and is involved as a member of the U.S. Metric Board. We appreciate having your testimony, Mr. Andrews. I regret to say that we have been given a 1:45 p.m. deadline for this room, but I trust we can get through by then, so please proceed. Your written statement will be made part of the record automatically and however you feel you can make the best contribution to our dialogue we would appreciate it.

[The biographical sketch of Mr. Andrews follows:]

SYDNEY D. ANDREWS

Syd Andrews is a native of Tallahassee and was educated in the public schools of Leon County. He attended Florida State University and Biarritz University in France. He is a petroleum chemist by profession.

He is a veteran employee of the Florida Department of Agriculture and Consumer Services, and has served this organization in numerous technical capacities. In 1968, he was appointed director of their division of standards, which contains the bureau of petroleum inspection and the bureau of weights and measures.

For many years, he has been active in the work of the American Society for Testing and Materials, and chaired their committee on petroleum products and lubricants. He was recently elected chairman of the board of directors of ASTM.

Until recently, he served as chairman of the American National Standards Institute's Committee Z-11 on petroleum products and lubricants and was their representative to the International Standardization Organization's Technical Committee 28 on petroleum products and lubricants. He headed the U.S. delegation to the 1978 meeting of this committee at The Hague, Netherlands.

He has also been very active in the work of the National Conference on Weights and Measures, and served as chairman of that organization in 1974-75. Until recently, he chaired the National Academy of Sciences evaluation panel for work in the Directorate of Measurement Services at the National Bureau of Standards.

For many years, he has been active in promoting the adoption of the metric system of measurement in this country, and holds membership in the U.S. Metric Association and the American National Metric Council. He served as chairman of the Florida Metric Council, which developed a model metrication plan for State jurisdictions.

He was one of the original appointees by President Carter to serve a 6-year term on the 17-member U.S. Metric Board created by the passage of the Metric Conversion Act of 1975. He fills the position designated to represent the National Conference on Weights and Measures and other standards organizations.

STATEMENT OF SYDNEY D. ANDREWS, DIRECTOR, DIVISION OF STANDARDS, FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES, TALLAHASSEE, FLA.; CHAIRMAN OF THE BOARD, AMERICAN SOCIETY FOR TESTING MATERIALS; AND MEMBER, U.S. METRIC BOARD

Mr. ANDREWS. Thank you, Mr. Chairman. In view of the time limitation I will perhaps follow the outline of my written testimony but with your assurance that it will be entered into the record I will not read it verbatim.

Mr. WALGREN. It will be there.

Mr. ANDREWS. Because I am sure you can read as well as or better than, I can, and because we do seem to be under time restraints, I would rather deliver the substance of my testimony rather than the words. With that I will begin my statement by saying that I am, as you mentioned, director of the Division of Standards in the Florida Department of Agriculture and Consumer Services. One of our major functions is to administer the State's weights and measures program and as such an official I had the privilege of serving as chairman of the National Conference on Weights and Measures (NCWM) in 1975 which, as you know, is sponsored by the National Bureau of Standards. During the period of 1978-80 I had the privilege of serving as chairman of the National Academy of Sciences (NAS) Evaluation Panel for the Directorate for Measurement Services (DMS) at the National Bureau of Standards. As you kindly referenced I was appointed by the President to serve a 6-year term on the U.S. Metric Board, which Congress authorized under the Metric Conversion Act of 1975, and as you may know, the Board has worked very closely with NBS to assure

proper use of the metric system under the voluntary program provided in the act. Also, this year I am honored to serve as chairman of the board of the American Society for Testing and Materials (ASTM), the largest and most prolific developer of voluntary consensus standards within the private sector of our country, and I am pleased to say that in addition to several cooperative programs with NBS we have many members from all levels of the Bureau who participate in the work of our technical committees. I give you this little recitation not to try and impress you with my credentials, but to try to give you some idea of why I am so vitally concerned with not only the function of the Bureau but the Organic Act that lays down the ground rules for it. Although my appearance here today is not as an official representative of any of these organizations, and the opinions expressed will be my own, I think I can safely say that they represent, in general, the concerns shared by my colleagues in these organizations. Also, I would like to make clear that my appearance here today is not as a critic, but as a friend—a concerned friend—not only for what I consider one of the great institutions of our Federal Government, but also for the constituency it serves. I would like to open my remarks by requesting that changes not be made in the Organic Act that result in new roles being given to NBS that would decrease its ability to carry out the important basic missions it now has. In my opinion the most basic of all missions for NBS is to serve as the custodian of the national standards of weights and measures in this country, and to supply the services necessary to assure accuracy at the highest appropriate level whenever measurements are made anywhere in the country—for whatever purpose. All other missions assigned the Bureau should be secondary to, and supportive of, this mission. This must include basic and applied research to constantly improve these services so as to keep pace with the rapidly changing technology and increasing sophistication of new measurement instruments and techniques.

Accuracy of measurement made throughout this country depends on traceability to national reference standards which are maintained by NBS. The measurement services required to provide this assurance are generated in the scientific and technical centers of the National Measurement Laboratory (NML) and the National Engineering Laboratory (NEL) which are the two major operating units of the NBS having measurement related assignments. The importance of these services cannot be overemphasized in assuring the economic and social well-being of our Nation. It is hoped that any restructuring of the Organic Act under which NBS operates will continue to emphasize this as their No. 1 mission. Simply stated, the goal of NBS should be to help improve the measurement capabilities of this country.

The National Bureau of Standards was created by congressional act in 1901 with straightforward mission statements regarding its responsibility in providing for measurement services. The Organic Act has been amended on numerous occasions since, and its mission broadened, with new responsibilities assigned to it.

If it is found necessary to amend the present statute the Bureau's role in providing basic measurement standards and related research should be reemphasized with special attention focused on

its role in providing enhanced meaurements, calibrations, and traceabiity.

Much concern is being expressed nationwide over the national decline in productivity and product quality. Emphasis is being placed on improving both of these areas which are bound to place a severe load on an already overburdened national calibration system. It appears that the calibration and measurement functions of the Bureau which are so vital, have atrophied at a time when they should be enhanced, and neglected when they should be emphasized.

It is recognized that the Bureau is doing some outstanding work in research of a high technology nature, but regretfully it seems to find too routine the task of developing practical means of delivering to its constituency the valuable measurement information which can be of such great commercial value, and have a tremendous impact on society in general. The Organic Act charges the Bureau with the responsibility of disseminating the results of its achievements, and the providing of basic standards of measurement from which legal metrology centers can confidently derive their working standards. This part of the act could stand some strengthening since this function is one which only can be provided by NBS.

The National Academy of Sciences Evalution Panel for the work of the Directorate for Measurement Services in the National Measurement Laboratory of NBS has expressed particular concern over this matter in its three most recent annual reports. The panel feels that delivery of meaurement services is often considered too mundane by decisionmakers to warrant the high priority it deserves, but instead they favor the more "glamorous" projects in the category of high science. In fairness to these decisionmakers at NBS we must recognize the fact that they are probably reacting to those reviewing their budget request who also are influenced by the attractiveness of more exciting high technology projects. Although not yet published by the NAS, I would like to recommend that the subcommittee obtain a copy of the report of the above mentioned panel which resulted from our meeting on October 28–29, 1980. It has a great deal to say on this subject. Perhaps the subcommittee might wish to study the possibility of rephrasing the Organic Act to emphasize the necessity of recognizing the continuing importance of this basic mission, mundane though it may seem to some.

Even though authorized to do so under the Constitution, Congress has never chosen to mandate a system of weights and measures for this country, nor provided for Federal regulatory authority in this area. Instead it has left this necessary Government function to the several States, and their local jurisdictions. However, the Organic Act, as amended, specifies that the Secretary of Commerce must cooperate with States in securing uniformity in weights and measures laws and methods of inspection, a function which has logically been delegated to NBS. Since 1905 this cooperation has been accomplished through the sponsorship of the National Conference on Weights and Measures by NBS, and has proven to be an excellent example of Federal-State cooperation is providing a valuable service to all citizens.

State and local weights and measures jurisdictions welcome this kind of assistance, and are anxious to cooperate in bringing about national uniformity which is not only desirable, but essential, to the orderly economical flow of goods and services throughout the nation. However, in recent years State and local weights and measures officials have been alarmed at the apparent diminishing interest in this activity by the management at NBS and the Department of Commerce, as indicated by the low priority assigned to ongoing weights and measures projects as well as initiatives for improvement. What alarms these weights and measures officials is the diminishing emphasis which is being placed on the service provided by NBS as demonstrated by the constant reduction in resoruces allocated to these responsibilities. In spite of the rapid growth in the country over the past decade, and the phenomenal increase in needs for services of this kind, the budget for the Office of Weights and Measures [OWM] is less than it was 10 years ago, and the personnel in that office has been decreased by more than 100 percent. When you consider what inflation has done to further subtract from that it is really shocking. At one time 10 years ago the Office of Weights and Measures had a high of approximately 29 people assigned to this vital function. They are now down to 11, I believe, and the possibility of 10 exists in the immediate future.

The Office of Weights and Measures was the implementing agency of the Organic Act which established the National Bureau of Standards in 1901. This office was then, and still is, primarily concerned with commercial weights and measures and legal metrology. By sponsoring the NCWM beginning in 1905 the Bureau has, through OWM, carried out one of its basic missions specified in the act, "cooperation with the States in securing uniformity in weights and measures laws and methods of inspection." Emphasis placed on this mission has varied over the years, but recently appears to have been assigned a rather low priority by the Bureau management, as evidenced by the reduction in both personnel and funds.

In my written testimony I cite a couple of examples, which I will not recite at this time, to demonstrate this lack of emphasis that we feel is seriously hurting the ongoing weights and measures programs and also the future of weights and measures in this country. These two problems are just examples of the need for a higher priority being given by NBS Research Centers when called on to work on advanced technology projects that will provide procedures, on a timely basis, for State and local weight and measures officials to evaluate the performance, and ultimately certify the accuracy, of complex, sophisticated, high technology, measuring devices. It is essential that OWM have the ear of the NBS management so that these needs will be addressed. Whether this takes an amendment, or simple reemphasis of the need to meet missions expressed in the present act, we do not know, but we suggest that the subcommittee investigate these needs, and recommend solutions.

The rapidly accelerating price of certain commodities in the marketplace accentuates the demand for greater precision and greater accuracy in commercial measuring devices. The kind of research required to keep weight and measures officials at the leading edge of these new demands are examples of the kind of research we feel

should be emphasized at NBS, not science for the sake of science. The research at NBS should be oriented toward measurement, not science itself. If properly addressed we feel that this kind of research could occupy NBS's time and all the resources that Congress is willing to give it.

I would like to interrupt my written testimony here to make a point illustrating the fact we are not just talking about the mundane weights and measures activity that people normally visualize. When you mention weights and measures they think of mom and pop grocery stores where they are weighing a pound of hamburger or checking the weight of a chicken. I am also talking about the highly sophisticated weighing and measuring devices in this country today that are absolutely essential for the progress of science. Do you think for 1 minute that this country could have ever launched a missile in Cape Canaveral, Fla. and 1 week or 10 days later placed a battleship in the Pacific with such precision that that missile fell within just a very short distance of it, had we been using the same measuring techniques that were in place in this country at the creation of the National Bureau of Standards in 1901. This exemplifies the kind benefits that can accrue from the kind of scientific research the Bureau should be involved in, the kind that makes it possible for this country to advance in measurements so that these things are possible.

If NBS does not recognize the serious need for attention to, and strong support of, commercial mesurement requirements in this country then the continued presence of OWM in NBS should be reexamined, and here we are certainly talking about amending the Organic Act. If this sounds drastic, consider that years ago Congress mandated that the Department of Agriculture oversee the weighing of meat and poultry products, and more recently it mandated a whole new grain inspection service, which includes the weighing of grain. Each breakdown, perceived or actual, of the commercial measuring system process motivates Congress to consider setting up a weights and measures program in some other agency, even though it is the general consensus of the weights and measures community that NBS should be the focal point for all matters pertaining to weights and measures in this country. It is with great concern that they see these things moving away from this great institution that should be the center of weighing and measuring activities for our entire country.

Providing educational programs is an important activity of the Office of Weights and Measures in carrying out the Bureau's mission of cooperating with the States in securing uniformity in weight and measures laws and methods of inspection. This includes training for inspectors and sealer, highly specialized technical training for metrologists, and administrative training for supervisors and administrators.

For the past 2 years the Office of Weights and Measures has been working in cooperation with educational institutions around the country to develop the types of programs necessary to fulfill these needs. These programs are being explored with universities, community colleges, and technical schools. It is the nature of the educational system of our country that programs such as these are likely to continue only if supported with Federal money. The exam-

ple set by the various defense agencies, NASA, the Department of Energy, and NIH, are very clear—if you want this kind of action you must help sponsor it. It is our plea that NBS provide sufficient resources to assure the success of these programs—even if it takes amending the Organic Act.

In the area of standards development and use it appears there needs to be a reexamination of the Organic Act, or the present role of the Bureau—or both—especially in view of the language in paragraph 272 (c) and (d). Recent events such as the GATT code, the Trade Agreements Act of 1979, and the OMB circular A-119 would seem to justify some changes in the Organic Act and the Bureau's role. Certainly, the latter dictates greater participation in private sector standards writing organizations for the development of standards needed by the Government, and greater use of these standards rather than the Government developing their own, except in those cases where there is a legitimate unique need. Participation by Bureau personnel in domestic standards writing organizations should be encouraged for many reasons, not the least of which is its cost-effectiveness, but also to assure that the Government's needs are addressed during the development process so that when finished these standards will be appropriate for adoption by the Government.

The Bureau's present role in the development and monitoring of international standards should be strengthened. The NAS Evaluation Panel for the DMS has repeatedly criticized the Bureau for the meager resources provided in this area, as well as that of monitoring participation in domestic standards developing organizations. The Office of Domestic and International Measurement Services (ODIMS), which has been assigned the lead role in this activity, has done well with what little they have had, but have never been provided adequate means for carrying out this great responsibility. The NAS Panel feels that a Government presence is essential in developing a U.S. position on proposed international standards in both treaty and nontreaty international standardization bodies. Government's role should be that of a helpful, equal partner, not a dominant influence, and if necessary this should be spelled out in the Organic Act, because to me this is a tremendously important consideration. The Government should not take over. The Government should be quite content to be an equal partner, doing their share, providing their share of the resources, and in no way dominating the international standardization field.

Mr. WALGREN. Let me interrupt at that point. There apparently was a conflict in scheduling this room so we are gradually violating the next committee. So if you would—I do not mean to stop you—but if there is some way you could take just 2 or 3 minutes to complete that would be fine and we will have to excuse ourselves.

Mr. ANDREWS. Since my written testimony is going to be on the record I think I can perhaps utilize the time better by commenting briefly on the draft bill which you sent me, not in total but on some of the sections. I want to say that I agree that part (2) under section 2 in paragraph 271 should be stated as a basic mission rather than a function of the Secretary. Because I feel this is by far the most important mission of the Bureau I would like to strongly suggest that it be listed as part (1) and the proposed part (1) be

listed as part (2). To me this spells out the basic mission of the Bureau in that one statement. The other comments I think are pretty well documented here. I would like to have just a word to say, if I may, about the section of the draft bill on the Visiting Committee. Coincidentally, I had prepared some remarks to be included in my testimony before I received the chairman's letter and the draft bill. I feel very strongly that the Visiting Committee needs to be enlarged and certainly to represent a broader cross section of the Bureau's constituency. In my prepared testimony I gave a few examples of some of the constituencies that I thought had such a great interest in the Bureau that they were certainly worthy of consideration. I hope that the subcommittee, if it is their will to amend the Organic Act to enlarge the Visiting Committee, will give consideration to some of those groups and segments of the constituency that I have enumerated in my written testimony. If we are running out of time I think perhaps, Mr. Chairman, I should stop here. In case you have one or two questions you would like to ask I will respond, but in case you do not I want to express my appreciation for the opportunity to testify today and compliment the subcommittee on making the decision to at least take a look at the Organic Act even though you may decide that it needs no change. Thank you.

[The prepared statement of Mr. Andrews follows:]

TESTIMONY OF SYDNEY D. ANDREWS PRESENTED TO THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY OF THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, 17 JUNE, 1981

Mr. Chairman, and gentlemen of the Subcommittee, my name is Sydney D. Andrews. I am Director of the Division of Standards in the Florida Department of Agriculture and Consumer Services. Within this division is located the State's Bureau of Weights and Measures. As a weights and measures official in 1975 I had the privilege of serving as Chairman of the National Conference on Weights and Measures (NCWM), which as you know is sponsored by the National Bureau of Standards (NBS). During the period 1978-80 I had the privilege of serving as Chairman of the National Academy of Sciences (NAS) Evaluation Panel for the Directorate for Measurement Services (DMS) at the National Bureau of Standards. In 1978 I was appointed by the President to serve a six year term on the United States Metric Board, which Congress authorized under the Metric Conversion Act of 1975, and as you may know the Board has worked very closely with NBS to assure proper use of the metric system under the voluntary program provided in the Act. Also, this year I am honored to serve as Chairman of the Board of the American Society for Testing and Materials (ASTM), the largest and most prolific developer of voluntary consensus standards within the private sector of our county, and I am pleased to say that in addition to several cooperative programs with NBS we have many members from all levels of the Bureau who participate in the work of our technical committees.

Although my appearance here today is not as an official representative of any of these organizations, and the opinions expressed will be my own, I think I can safely say that they represent, in general, the concerns shared by my colleagues in these organizations. Also, I would like to make clear that my appearance here today is not as a critic, but as a friend - a concerned friend - not only for what I consider one of the great institutions of our Federal government, but also for the constituency it serves.

I would like to open my remarks by requesting that changes not be made in the organic act that result in new roles being given to NBS that would decrease its ability to carry out the important basic missions it now has. In my opinion the most basic of all missions for NBS is to serve as the custodian of the national standards of weights and measures in this country, and to supply the services necessary to assure accuracy at the highest appropriate level whenever measurements are made anywhere in the country - for whatever purpose. All other missions assigned the Bureau should be secondary to, and supportive of, this mission. This must include basic and applied research to constantly improve these services so as to keep pace with the rapidly changing technology and increasing sophistication of new measurement instruments and techniques.

Accuracy of measurements made thorughout this country depends on traceability to national reference standards which are maintained by NBS. The measurement services required to provide this assurance are generated in the scientific and technical centers of the National Measurement Laboratory (NML) and the National Engineering Laboratory (NEL) which are the two major operating units of the NBS having measurement related assignments. The importance of these services cannot be overemphasized in assuring the economic and social well-being of our nation. It is hoped that any restructuring of the organic act under which NBS operates will continue to emphasize this as their number one mission. Simply stated, the goal of NBS should be to help improve the measurement capabilities of this country.

The National Bureau of Standards was created by Congressional Act in 1901 with straight forward mission statements regarding its responsibility in providing measurement services. The organic act has been amended on numerous occasions since, and its mission broadened, with new responsibilities assigned to it.

If it is found necessary to amend the present statue the Bureau's role in providing basic measurement standards and related research should be reemphasized with special attention focused on its role in providing enhanced measurements, calibrations, and traceability.

Much concern is being expressed nation-wide over the national decline in productivity and product quality. Emphasis is being placed on improving both of these areas which are bound to place a severe load on an already overburdened national calibration system. It appears that the calibration and measurement functions of the Bureau which are so vital, have atrophied at a time when they should be enchanced, and neglected when they should be emphasized.

It is recognized that the Bureau is doing some outstanding work in research of a high technology nature, but regretfully it seems to find too routine the task of developing practical means of delivering to its constituency the valuable measurement information which can be of such great commercial value, and have a tremendous impact on society in general. The organic act charges the Bureau with the responsibility of disseminating the results of its achievements, and the providing of basic standards of measurement from which legal metrology centers can confidently derive their working standards. This part of the Act could stand some strengthening since this function is one which only can be provided by NBS.

The National Academy of Sciences Evaluation Panel for the work of the Directorate for Measurement Services in the National Measurement Laboratory of NBS has expressed particular concern over this matter in its three most recent annual reports. The Panel feels that delivery of measurement services is often considered too mundane by decision makers to warrant the high priority it deserves, but instead they favor

the more "glamorous" projects in the category of high science. In fairness to these decision makers at NBS we must recognize the fact that they are probably reacting to those reviewing their budget request who also are influenced by the attractiveness of more exciting high technology projects. Although not published by the NAS, I would like to recommend that the Subcommittee obtain a copy of the report of the above mentioned panel which resulted from our meeting on October 28-29, 1980. It has a great deal to say on this subject. Perhaps the Subcommittee might wish to study the possibility of rephrasing the organic act to emphasize the necessity of recognizing the continuing importance of this basic mission, mundane though it may seem to some.

Even though authorized to do so under the Constitution, Congress has never chosen to mandate a system of weights and measures for this country, nor provided for Federal regulatory authority in this area. Instead it has left this necessary government function to the several states, (and their local jurisdictions). However, the organic act, as amended, specifies that the Secretary of Commerce must cooperate with states in securing uniformity in weights and measures laws and methods of inspection, a function which has logically been delegated to NBS. Since 1905 this cooperation has been accomplished through the sponsorship of the National Conference on Weights and Measures by NBS, and has provided an excellent example of Federal-State cooperation in providing a valuable service to all citizens.

State and local weights and measures jurisdictions welcome this kind of assistance, and are anxious to cooperate in bringing about national uniformity which is not only desirable, but essential, to the orderly economical flow of goods and service throughout the nation. However, in recent years state (and local) weights and measures officials have been alarmed at the apparent diminishing interest in this activity by the management

at NBS and the Department of Commerce, as indicated by the low priority assigned to on-going weights and measures projects as well as initiatives for improvement. What alarms these weights and measures officials is the diminishing emphasis which is being placed on the services provided by NBS as indicated by the constant reduction in resources allocated to these responsibilities. In spite of the rapid growth in the country over the past decade, and the phenomenal increase in needs for services of this kind, the budget for the Office of Weights and Measures (OWM) is less than it was ten years ago, and the personnel in that office has been decreased by more than 100%.

The Office of Weights and Measures was the implementing agent of the organic act which established the National Bureau of Standards in 1901. This office was then, and still is, primarily concerned with commercial weights and measures and legal metrology. By sponsoring the NCWM beginning in 1905 the Bureau has, through OWM, carried out one of its basic missions specified in the Act, "----cooperation with the states in securing uniformity in weights and measures laws and methods of inspection." Emphasis placed on this mission has varied over the years, but recently has appeared to have been assigned a rather low priority by the Bureau management, as evidenced by the reduction in both personnel and funds.

The prototype examination program of commercial weighing and measuring devices is an excellent example of this. Although the examination of these devices for compliance with accepted standards prior to being allowed used in the various jurisdictions is beneficial, it makes no economic sense for each jurisdiction to have to make their own examination and consequently this role was assumed by the OWM of NBS many years ago. However, because of inadequate resources being provided for this work

the results have been of limited value to the various jurisdictions, and at times a hinderance to the weights and measures industry, even though this work is self-supporting. Recent improvements in this program have been initiated through a reciprocal agreement with the State of California which is hoped will help to provide this service on a timely basis. The NAS Evaluation Panel recommended that perhaps this work should be done under contract by independent testing laboratories using standards developed by a consensus process with OWM personnel, state officials, and industry personnel working together to develop the standards used as criteria for evaluating this equipment and NBS Managing the program.

The Grain Moisture Meter Testing Program which is carried out by state jurisdictions is another example of a great need for assistance to resolve a major problem existing in the marketplace which did not receive the high priority weights and measures officials feel it justified based on the economic impact it has on the exchange of these commodities. Although NBS took a lead role in improving the accuracy of the calibration of these instruments, the weights and measures community in general felt that had a higher priority been assigned this project the vast resources of the Bureau's Research Centers oriented toward measurement and calibration enhancement could have produced greater improvement, at an earlier date, in the calibration of these important instruments.

The two problems cited above are but examples of the need for higher priority being given by NBS Research Centers when called on to work on advanced technology projects that will provide procedures, on a timely basis, for state and local weights and measures officials to evaluate the performance and ultimately certify the accuracy of, complex, sophisticated, high technology, measuring devices. It is essential that OWM have the ear of the NBS management so that these needs will

be addressed. Whether this takes an amendment or simple reemphasis of the need to meet missions expressed in the present Act we do not know, but we suggest that the Subcommittee investigate these needs, and recommend solutions.

The rapidly accelerating price of certain commodities in the marketplace demands greater accuracy in their measurement (petroleum, precious metals, etc.). The high cost of labor leads to demands for higher productivity, using fewer people (automated test equipment, in-motion weighing, etc.). Weights and measures officials who are charged with the responsibility of determining and certifying the accuracy of these scphisticated device must rely on the Research Centers of NBS to develop the methods for making such determinations and transfering this information to them for practical application. The kinds of research required to keep weights and measures officials at the leading edge of these new demands are example of the kinds of research we feel should be emphasized at NBS -- not science for the sake of science.

We fully appreciate that in an era when measurements in medicine, in the environment, and in pure science are so intellectually challenging that the needs of commerce may seem mundane and hardly worthy of having devoted to it more than just token resources. Yet, when we consider that one-third of the Gross National Product is in real goods, and that those goods are measured probably three times each, this lessening of interest is damaging to the economy of the country - and to the image of NBS, which has been assigned these responsibilities under the organic act.

If NBS does not recognize the serious need for attention to, and strong support of, commercial measurement requirements in this country then the continued presence of OWM in NBS should be reexamined, and here we are certainly talking about amending the organic act. If this soundsdrastic, consider that years ago Congress mandated

that the Department of Agriculture oversee the weighing of meat and poultry products, and more recently it mandated a whole new grain inspection service, which includes the weighing of grain. Each breakdown, perceived or actual, of the commercial measuring system process motivates Congress to consider setting up a weights and measures program in some other agency, even though it is the general consensus of the weights and measures community that NBS should be the focal point for all matters pertaining to weights and measures in this country.

Providing educational programs is an important activity of the Office of Weights and Measures in carrying out the Bureau's mission of cooperating with the state's in securing uniformity in weights and measures laws and methods of inspection. This includes training for inspectors and sealers, highly specialized technical training for metrologists, and administrative training for supervisors and administrators.

For the past two years the Office of Weights and Measures has been working in cooperation with educational institutions around the country to develop the types of programs necessary to fulfill these needs. These programs are being explored with universities, community colleges, and technical schools. It is the nature of the educational system of our country that programs such as these are likely to continue only if supported with Federal money. The example set by the various defense agencies, NASA, the Department of Energy, and NIH, are very clear -- if you want this kind of action you must help sponsor it. It is our plea that NBS provide sufficient resources to assure the success of these programs -- even if it takes amending the organic act.

In the area of standards development and use it appears there needs to be a reexamination of the organic act, or the present role of the Bureau - or both - especially in view of the language in Paragraph 272 (c) and (d). Recent events such as the GATT Code, the Trade Agreements Act of 1979, and the OMB Circular A-119 would seem to justify some changes in the organic act and the Bureau's role. Certainly, the latter dictates greater participation in private sector standards writing organizations for the development of standards needed by the government, and greater use of these standards rather than the government developing their own, except in those cases where there is a legitimate unique need. Participation by Bureau personnel in domestic standards writing organizations should be encouraged for many reasons, not the least of which is its cost effectiveness, but also to assure that the governments needs are addressed during the development process so that when finished these standards will be appropriate for adoption by the Government.

The Bureau's present role in the development and monitoring of international standards should be strenthened. The NAS Evaluation Panel for the DMS has repeatedly criticized the Bureau for the meager resources provided in this ares, as well as that of monitoring participation in domestic standards developing organizations. The Office of Domestic and International Measurement Services (ODIMS), which has been assigned the lead role in this activity, has done well with what little they have had, but have never been provided adequate means for carrying out this great responsibility. The NAS Panel feels that a government presence is essential in developing a United States position on proposed international standards in both treaty and non-treaty international standardization bodies. Government's role should be that of a helpful, equal, partner, not a dominent influence, and if necessary this should be spelled out in the organic act.

It has come to my attention from several sources over recent years that Congress has mandated certain programs the Bureau must undertake, without adequately exploring whether these programs reasonably fall within the mission of NBS. It has also come to my attention that on occasions these mandated programs were not funded on a timely basis, and in order to carry them out mission oriented programs had to be interrupted, diminished, or terminated. I do not question the authority, or the wisdon, of Congress in identifying national needs of such importance as to require immediate attention by a well established technical organization such as NBS, but I do hope that in the future the Bureau will be brought into such decisions during the planning stage, and that adequate funding will be appropriated at the time the legislation is passed. It is my plea that the Congress will allow the Bureau managment to participate in the drafting of such legislation so that disparities can be addressed and remedied, if possible, prior to the enactment of such laws.

Unlike most other government, and private sector, laboratories NBS is a multidiscipline organization. This makes it attractive as a solver of problems in many areas, and there is a great temptation to overload it with extra activities. However, it must be remebered that these multidisciplines are for a purpose that must not be diminished, and that is to provide the variety of research - both basic and applied - to carry out the Bureau's mission of providing measurement standards and services. It is hoped that the Congress will make no changes in the organic act that would result in new roles being given to the Bureau that would decrease its ability to carry out this important mission, because the need for this basic type of activity by NBS is greater today than ever.

At the invitation of the Subcommittee Chairman I would now like to comment on the draft of a bill entitled "National Bureau of Standards Act of 1981" which was enclosed in his letter to me dated June 5, 1981.

I agree that Part (2) under Sec. 2 in Paragraph 271 should be stated as a basic mission rather than a function of the Secretary. Because I feel this is by far the most important mission of the Bureau I would like to strongly suggest that it be listed as Part (1) and the proposed Part (1) be listed as Part (2).

In Part (2) I would suggest inserting the words "---measurement and standards"--- between the words basic and technologies in Line 4 of that part. This would somewhat narrow the scope of the Bureau's functions to more nearly coinside with what I feel the Bureau's primary mission should be.

For the same reason I would like to suggest that the word measurement be added between the words national and problems in Line 1 of proposed Part (3) of Paragraph 271.

I am pleased to see the proposed enlarging, and broadening the base, of the visiting committee in the draft bill. In the original draft of my testimony, which was done prior to receiving the Chairman's letter of June 5 that contained a copy of this draft bill, I had recommended restructuring the visiting committee myself, and therefore, I would like to say a few words on that subject.

No one could seriously question the credentials, the interest, or the dedication, of those presently serving on the visiting committee, nor those who have served in the past, but they represent only a narrow, albeit very important, segment of the Bureau's constituency - mostly research and high technology from academia or research oriented organizations. Because of the fact that these people do represent a segment of our

society that depends on services which can only be provided by the Bureau I would certainly urge that they continue to have representation on the Committee. However, I feel there are many other segments of society which are dependent, either directly or indirectly, on the services of the Bureau which also should be represented, and they could make valuable contributions to the success of the mission of the Bureau if allowed to participate in the deliberations and recommendations of this important committee.

Examples of other segments of society which are vitally dependent on accurate measurements and should be considered for membership on the visiting committee are: those in industrial production, distribution, and maketing; makers of measurement sensitive instruments and devices, both large and small, electronic as well as mechanical (and their users); standards and certification laboratories whose work is extremely measurement intensive; members of the voluntary standards development organizations whose products are almost invariable dependent on accurately prescribed measurements; state and local officials whose daily responsibilities are the policing of measurements. This list could go on and on, and I am certainly not suggesting that each of these should be represented at all times, for the committee would be too large and unmangeable. However, I do feel it would be advantageous to have a slightly larger visiting committee that represented a broader cross section of the Bureau's constituency than is presently the case, and I am pleased to see that the proposal in the draft bill calls for this.

As I come to the end of my testimony I want to commend the Subcommittee for the interest it has shown in NBS by holding these hearings. I wish to express by gratitude for

being allowed the privilege of appearing before you today to present some of my views regarding this great institution, and for allowing me to offer a few suggestions as to things I feel are worthy of the Subcommittee considering. Most especially I thank you for giving me the opportunity to make some recommendations which I feel could improve the Bureau's services to its constituency in light of the changing times and the continuing need that exist for this great, but this unique, Federal establishment. There is much more I could say - even more I would like to say, but you have been very patient, so I will close now and offer to respond to any questions the Subcommittee may like to ask.

Before doing so I would leave you with one final thought. Over the years numerous amendments have been made by other Congresses to the organic act to keep pace with changes in our society. Some of these amendments have substantially expanded the mission of the Bureau and added many new responsibilities. The organic act, as amended, has so broadened the mission of the Bureau that a temptation exists to assign it programs with little relevance to its original - and still valid - mission. It is my hope that this Congress will resist any temptation to further dilute this basic mission.

Accronyms used:

NAS - National Academy of Sciences

NBS - National Bureau of Standards

NML - National Measurement Laboratory

NEL - National Engineering Laboratory

DMS - Directorate for Measurement Services

ODIMS - Office of Domestic and International Measurement Services

OWM - Office of Weights and Measures

NCWM - National Conference on Weights and Measures

ASTM - American Society for Testing and Materials

Mr. WALGREN. We appreciate your contribution very much. On behalf of the subcommittee I would like to thank you for your patience and "the effort that you put forth to make this presentation. We appreciate your constructive comments. The emphasis you place on preserving the central function of the Bureau will not be lost on us. We certainly may be back to you for some kind of further followup if it seems necessary.

Mr. ANDREWS. I would welcome the opportunity.

Mr. WALGREN. Thank you very much. We appreciate your coming.

[Whereupon, at 1:45 p.m. the subcommittee adjourned.]

REVIEW OF THE NATIONAL BUREAU OF STANDARDS ORGANIC ACT

THURSDAY, JUNE 18, 1981

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,
Washington, D. C.

The subcommittee met at 10:10 a.m., in room 2318, Rayburn House Office Building; Hon. Doug Walgren (chairman of the subcommittee) presiding.

Present: Representatives Walgren, Shamansky, and Skeen.

Also present: John D. Holmfeld, science policy consultant; Thomas H. Moss, staff director.

Mr. Walgren [presiding]. The hearing will start. We expect to be joined by other members of the subcommittee, who will be in and out during the morning. There are, I'm afraid, so many commitments scheduled at the same time for these Members of Congress that we have to make a record for them through the hearing process and use that record as a basis for discussions with them at later times.

This is the third day of hearings on a review of the Organic Act of the National Bureau of Standards. I certainly appreciate the effort and the patience of the witnesses we will have today. In the first 2 days of hearings, varied views about the degree of change we need, if any were expressed. It just strikes the committee that the talent at the Bureau of Standards has a significant role to play in the efforts of making our economy run as well as possible and to develop as fully as possible in the next decades.

Inasmuch as the act has not been reviewed by the Congress in about 30 years, it would seem to make sense to discuss with people who are knowledgeable in that area what the most optimum situation for the Bureau would be.

So with that, let me welcome our first witness, James Bird, of the National Conference on Weights and Measures and the New Jersey Office of Weights and Measures.

We appreciate your going out of your way to be here with us and let me simply say that your written testimony will be made a part of the record.

[The biographical sketch of Mr. Bird follows:]

JAMES R. BIRD, DEPUTY STATE SUPERINTENDENT OF THE NEW JERSEY OFFICE OF WEIGHTS AND MEASURES AND REPRESENTATIVE OF THE NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

As per your request, I have prepared a short biographical sketch. I am James R. Bird, Deputy State Superintendent of New Jersey Weights and Measures, with 34 years of service and have been Deputy for the past 11 years. I have managed programs; written legislation and regulations pertaining to weights and measures; developed a Basic Course on Weights and Measures, which all new New Jersey officials within the past ten years were required to complete; participated in many types of seminars designed to educate members of industry, commerce, and the public on weights and measures; and assisted in developing a continuing fuel fraud strike force, which resulted in criminal convictions.

I am Governor Byrne's representative to the United States Metric board meetings and have participated in the Organization of Legal Metrology (OIML) meetings both here and in Europe.

I am an active participant in the National Conference on Weights and Measures, which is sponsored by the National Bureau of Standards; The Northeastern Weights and Measures Association, and the New Jersey and Pennsylvania Weights and Measures Associations.

I have served in many capacities, including elder, in church programs and associations. I have served in many capacities in the Scouting program and have been a member of the Burlington County Executive Board for over 10 years and have served in many other civic and community activities.

I am a veteran of World War II and served in the North African and European Theaters. I was awarded the Silver Star and the Purple Heart.

STATEMENT OF JAMES R. BIRD, NATIONAL CONFERENCE ON WEIGHTS AND MEASURES, AND DEPUTY STATE SUPERINTENDENT, NEW JERSEY OFFICE OF WEIGHTS AND MEASURES, TRENTON, N.J.

Mr. BIRD. Good morning, Mr. Chairman. I welcome the opportunity to be here. In fact, I was determined to be here.

I'm James R. Bird, Deputy State Superintendent of Weights and Measures in New Jersey, representing the National Conference on Weights and Measures and the Northeastern Weights and Measures Association. I have over 30 years' experience in weights and measures. I've been involved in many State weights and measures programs, and we're expanding into new areas, both in New Jersey and in other States; that is, product standards and the verification of the industrial and law enforcement standards.

At one time, the Bureau took care of many calibration services that have been now passed off to the States. The agent for the transfer of these services is the National Bureau's Office of Weights and Measures. We've become concerned because of the reduction in staff. Of the approximately 3,000 full-time members of the National Bureau of Standards, they have reduced the Office of Weights and Measures staff to 11, which includes 2 secretaries.

I have several pages of recommendations to the Organic Act, which I will not read in detail because they are printed in detail. But we are concerned that the act be amended to mandate certain things because we have perceived in the past 2 years that the management has sluffed off many of the responsibilities to the States.

However, there is one particular section of our proposal that I would read, which is a proposed change to the committee proposal that I received a copy of. That is on page 8 of your proposal, to change the visiting committee section to read:

There shall be a visiting committee of 9 members to be appointed by the Secretary of Commerce to consist of persons prominent in the various areas of responsibility of the Bureau under this Act and not in the employ of the government. Two

shall be experienced in state regulatory programs. Two shall be expert in trade and commercial technology and processes. Two shall be knowledgeable of industrial manufacturing or its management. Two shall be experts in scientific research or its administration. And one shall be at large, preferably representative of national interests.

We make this recommendation because in our observation, all the reviews of the Bureau in the past have been by the scientific fraternity and these other groups have not been represented, to our knowledge. And we think that one representative should be one at large because, in effect, somebody has to be able to tell the emperor that he doesn't have his clothes on.

The main thrust of our recommendations is to change certain authorizing sections to mandating sections to provide the services to the State and sponsorship of the National Conference on Weights and Measures.

The agency—that is the OWM—for many years satisfied the needs of the States through calibration services which consisted of mass, length, and volume and other types of services. State officials are worried reductions in the OWM staff and recent transfer of the railroad track scale program to the Federal Grain Inspection Service is perceived as a calculated diminution of basic responsibilties granted in the Organic Act. Not only are these losses of services being felt at the State level, but we have exhilarating need for technological support, professional advice, and for the construction of training models.

I would like to point out here that back in January, in conjunction with the National Conference on Weights and Measures, the Office of Weights and Measures, and the Texas Agriculture College, we had a several day seminar down there and discussed models for training. This is the report that just came out within the past week or so.

Congressman Phil Gramm from Texas is quite concerned about this and he's sponsoring legislation, I believe, that would provide funding for the training for weights and measures.

We speak here today about problems adversely affecting State programs and my comments and recommendations are, in the aggregate, held by most State directors of weights and measures. These concerns are also noted in the 65th National Conference Program Report, which is this [indicating] very complete book on the last conference that we had.

One section of this report, a segment of it:

It is felt that the development of a metrological control program would benefit NCWM and its member jurisdictions in a number of ways. One such potential benefit identified by the committee would be a clearer and more formalized determination of the optimum relationship between NBS and NCWM in the joint pursuit of measurement equity.

State weights and measures programs are seen as being more efficient and effective than similar Federal programs. I'm talking about the FDA program and the meat inspection program, the poultry inspection program of the U.S. Department of Agriculture and the like, and the National Marine Fisheries as part of the National Department of Commerce.

But in the NBS and the OWM office, support services are necessary to develop, coordinate, and maintain uniform enforcement of

equity standards in the market place by weights and measures officials.

OWM service should be restored and mandated because the technology and jurisprudence of weights and measures enforcement has become exceedingly complex and because the scope of weights and measures have broadened to include product standards.

Within the past decade, simple weighing and measuring devices involved in the complex measurement systems and standards, calibration responsibility—that is for industrial and law enforcement—and I'd like to take an aside here. You would question why we talk about law enforcement.

It is necessary that when an officer stops you with radar for speeding, that he have an accurate device. There are procedures which we use to verify these. So that in New Jersey, when you're stopped by a New Jersey State policeman on radar, you can be reasonably sure that his device is correct because we have a traceability standard to that device.

The same way if you were fishing and a game warden came along and he said, your trout is only 11 inches, and he had a 9-inch rule. You would be unfairly fined for something with a false device.

So we're quite involved in New Jersey enforcement. We've been into this for quite some time. And we do a great deal of work for New Jersey industry that are involved in Federal contracts that require this traceability to the National Bureau of Standards.

This calibration service has expanded not only from length, mass and volume to include frequency, temperature, pressure, time and electromagnetic forces, and a prepackaging of commodities as exhilarated.

State directors are complaining because their needs in these regards are not being met.

Now I have outlined in the following three pages arguments for some of these things. In the Office of Weights and Measures, the staff should be increased to meet the mandated responsibilities to the States that are involved in the National Conference on Weights and Measures, the International Organization of Legal Metrology, the Fair Packaging and Labeling Act, and prototype approval.

You have all heard the adage: "Don't work a good horse to death." That, in effect, is what is being done to the Office of Weights and Measures staff. I know them all personally and have high regard for the professional competence, but they are all overloaded. While the staff was being reduced, greater and new responsibilities were added such as the prototype evalutaion, grain moisture determination, and OIML. In fact, there are other parts of the Bureau that have flagged on services to the State. Although the OWM is the direct organization we deal with from the States to the National Bureau of Standards, the people that are involved in mass calibration and volumetric calibration for State standards and the like have been reduced at the Bureau.

I believe there's only one man now for mass and there's a similar situation in the volumetric section. There's no backup. There's no body of information that can be continued.

The laboratory auditing program, which is a good program because for many years, the State directors criticized the 10-year recalibration cycle where we took our standards back to NBS every

10 years for reevaluation and certification because the personnel and the calibration apparatus—that is the balances and the other type of apparatus that these things were used on—were not examined. You could have good standards, but if you didn't have trained personnel or competent balances and the like, there are all kinds of problems that were caused.

The laboratory auditing program now in use is designed to evaluate all of these three—the standards themselves, the metrologist, and the balances.

However, it must be expanded to include all standards—length, volume, temperature, and the like, because currently, they're only doing this with the mass sections.

These services can only be a basic responsibility of NBS and should be provided at no cost to the State. Moreover, 15 U.S.C. 202 should provide for the maintenance of all State metrology calibration apparatus such as balances.

The National Conference on Weights and Measures Director Stratton, the first director of NBS, sponsored the First National Conference on Weights and Measures, 1905, which has become a living and vital organization whose aggregate efforts produce a body of technical, legal and philosophical knowledge of weights and measures. Justification to mandate the continued sponsorship of NCWM is now greater than ever before.

I'd like to point out two monuments of the early director. This is a report that the National Bureau of Standards did in 1911, surveying the situation in New Jersey and in the sixth conference in 1912, they developed a model law for weights and measures. These two things came together and became the first comprehensive weights and measures law in New Jersey that we're now using. It is much like a Pennsylvania stone barn: It stood the test of time. It's needed a new door, new window here and there, but it's been a good law. In fact, in my own mind, it's better than the model law that some of the States are using now.

Not many years ago, OWM staff could function as technical advisors to the standing committees. There are four standing committees of the conference—specifications and tolerances, laws and regulations, education, which was partially responsible for this, and liaison.

Now every year, the tentative committee reports of these four committees come out in a publication like this [indicating] prior to the conference for study by weights and measures people, anybody that's concerned with it, industry, all kinds of commerce. They all show up and make their presentations and from that, we get a report like this one, right here [indicating]. That's the final report.

The function and other capacities for the last 10 years of the technical advisers to these committees has broadened to be far beyond what they were. It requires a great deal of research and coordination with a multiplicity of trade, commercial and industrial organizations, and other Federal agencies has expanded the duties to full-time operations.

Moreover, required liaison with four regional weights and measures associations—the Western, the Southern, the Northwestern, and the Northeastern—has expanded their duties. Beginning with the 51st conference in 1966, the conference was frequently moved

to cities other than Washington, D.C., to permit a much wider participation by local weights and measures officials, industrial people, commercial people, and consumer organizations.

The Fair Packaging and Labeling Act, which came about, I think, in 1968, the function of coordinating this act should repose in the Office of Weights and Measures rather than in another bureau of NBS, where it now lies.

Currently, the technical adviser to the Laws and Regulations Committee researches the preparation of model laws and regulations relating to marketing requirements.

And in this book here [indicating], I have two things that have come out of that Laws and Regulations Committee. It's a new handbook on the checking of contents of prepackaged goods and it's taken quite a bit of research. This is a model that weights and measures people will have to use to check packages. Out of that committee comes the model State laws and regulations. This is another book that comes out of that, and there's a great deal of work involved in those things.

Because all of those things should be coordinated together, that Fair Packaging and Labeling Act should repose in that section.

We are also concerned because we understand that the Bureau has requested to be relieved of the responsibility in this area, especially at this time when States are facing more legal problems affecting domestic and international trade. The International Organization of Legal Metrology is a fact. The United States is a signatory to this treaty and we are morally bound to accept the principles thereof. Participation in these activities has added responsibilities to the technical adviser to the Specifications and Tolerance Committee and through that committee to the conference. The additional work is engendered, and there's a great deal of things that have to be coordinated with the other organizations such as the National Scale Manufacturers Association, the National Meter Manufacturing Association, and the like.

State and Bureau participate in this international forum to insure that our international markets are maintained in a healthy state.

Prototype approval. This is something that I think 14 or 15 States have laws requiring approval of new weighing and measuring devices. Because of the change from individual devices from scales and meters to weighing and measuring systems, the evaluation thereof has become more complex. It should repose in a place like the National Bureau of Standards to evaluate these and provide reports to the States.

It's an economic burden which I believe the National Scale Manufacturers may testify to, that when they want a new device approved, that if they can go to one place, NBS, and get a prototype approval certificate, it foreshortens the cost, because if they have to take that device to 14 States, it can be very costly to get a new device on the market.

Administrative and management section. State directors draw on professional advice from OWM in the preparation of legislation, regulations, programs, and budget justification. Few such agencies are sufficiently staffed to have a full body of knowledge about these subjects. Consequently, OWM should be in a position to provide

such information, including the capability to evaluate State programs and prepare training models, including that for metrology.

All of the above is necessary to establish a base of uniform weights and measures enforcement, a concern reported in the annals of the 65th and 66th conference reports. That's these reports here [indicating].

The railroad track scale program was in the Office of Weights and Measures for many years, up until probably 2 years ago, when it was transferred to the Federal Grain Inspection Service. Before FGIS took it over, the Bureau had both railroad test cars refurbished and brought up to date, which cost them a bundle of money, before the Federal Grain Inspection Service people would take them.

Now on contract, they're supposed to be calibrating the 17 master railroad track scales around the country and there are 2 in Pennsylvania, 1 in Reading and 1 in Altoona. It's very important that these be done in a proper manner. Rather than an enforcement agency doing them, such as the Federal Grain Inspection Service, a responsible agency such as NBS should be responsible for it. And then, as possible, sample testing of the roughly 3,000 to 3,500 railroad scales around the country should be tested with these test cars because no State has the facilities to do it. And we can't afford to get the facilities to do it because those cars are very expensive and there are a few States, like Minnesota, that have quite a few scales, that maybe would warrant a test car. But no other State really could afford it.

The delegation of this responsibility to a Federal inspection service was not in the best interest of the national economy.

Visiting committee. We believe that this committee should be structured to represent all agencies, organizations, industries, commerce, and the public depending on NBS for services. It appears that past reviews of the Bureau were conducted by scientists and the like who showed little or no concern for State weights and measures and legal metrology programs.

We hope that the committee will consider our recommendations to amend the Organic Act, mandating to the States without charge certain services by the Director of NBS. We believe our concerns warrant this action to continue to assist State directors of weights and measures programs to maintain "equity" in the marketplace.

It's been said that nothing succeeds like success. The success should be mandated to preclude any future problems. Currently, the system is being stretched to the breaking point with the States not getting the service from the National Bureau of Standards Office of Weights and Measures.

[The prepared statement of Mr. Bird follows:]

State of New Jersey

JAMES R. ZAZZALI
ATTORNEY GENERAL
[redacted]

DEPARTMENT OF LAW AND PUBLIC SAFETY
DIVISION OF CONSUMER AFFAIRS
OFFICE OF WEIGHTS AND MEASURES
187 WEST HANOVER ST.
TRENTON, N.J. 08625

ADAM K. LEVIN
DIRECTOR

June 18, 1981

The Honorable Douglas Walgren, Chairman
Subcommittee on Science, Technology, and Research
United States House of Representatives
Suite 2321 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Walgren:

SUBJECT: Hearings on the Organic Act of the National Bureau of Standards (NBS)

I am James R. Bird, Deputy State Superintendent of the New Jersey Office of Weights and Measures representing the National Conference on Weights and Measures (NCWM), (an association of directors of state weights and measures programs) and the Northeastern Weights and Measures Association (NEWMA), (an association of weights and measures officials from fourteen states), and welcome this opportunity to express concerns about the perceived policy of National Bureau of Standards to reduce long-standing support to national and state weights and measures programs.

I have over thirty years experience as a state weights and measures official and am Chairman of a Special Study Group commissioned by the NCWM to shape a model weights and measures program to suit future needs. Reference: Tentative report for the 66th NCWM, voting key 102.

State programs are, in fact, expanding into new areas (product standards; verification of industrial standards of temperature, pressure, time, and frequency; and investigations of frauds in commodity transfers. Everyone of these areas is measurement dependent. In many cases, state, federal, or industrial regulations or contracts require traceability to national standards.

State weights and measures responsibilities are increasingly dependent on the transfer of measurement technology (such as that envisioned law, the Stevenson-Wydner Act) from National Bureau of Standards. The agent for that transfer is the Office of Weights and Measures. At the time when state needs are increasing, the staff of OWM is being decreased. Of the approximately 3,000 full-time staff at NBS, the Bureau's management has reduced OWM staff to 11 (including two secretaries).

At the outset we recommend amending the 1901 Organic Act of NBS (15 USC 271 et seq.) to mandate the agency to:

I. Expand the Laboratory Auditing Program (LAP) now in the NBS Office of Weights and Measures (OWM) to include all measurement standards used in state laboratories. This system now only relates to mass standards.

II. Restore sufficient personnel to OWM to enable them to meet and coordinate the needs of state directors, coordinate Fair Packaging and Labeling Act (FPLA) requirements, coordinate International Organization of Legal Metrology (OIML) activities, and conduct prototype approval evaluations of new weighing and measuring systems.

III. Continue sponsorship of the National Conference on Weights and Measures initiated in 1905.

IV. Return the Railroad Track Scale program to OWM, which was recently transferred to the Federal Grain Inspection Service FGIS), United Stated Department of Agriculture.

In addition, we recommend 15 USC 202 be amended to require NBS to provide maintenance service to calibration apparatus (balances, etc.) used in state metrology labs.

Specific proposed amendments are:

A. Section 272 The Director of the National Bureau of Standards (hereinafter referred to as the "Director") is authorized and directed to initiate, carry out research, technology development, technology transfer, and demonstration projects to provide the basic measurement needs of commerce and industry through the following functions:

(a) The custody, maintenance, and development of the national standards of measurement, and the provision of means and methods for making measurements consistent with those standards, including the comparison of standards used in commerce, manufacturing, engineering, scientific investigations, and educational institutions.

(b) Coordination of standard measurement practices among Federal, State, and local government agencies to promote uniformity and equity-in-trade through incorporation in codes and specifications.

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(c) Cooperation with industry, business, and private organizations in the establishment of standard practices, incorporated in codes and specifications.

B. In carying out the functions of this section it is mandated that the Director undertake the following activities:

(1) The definition and establishment of the values of the primary units of measurement on an absolute basis and the quantities derived therefrom; and assurance that these units are accurately realized, internationally compatible, and accessible to a broad range of users;

(2) The construction, testing, calibration, and certification of standards and standard measuring apparatus;

(3) The study and improvement of instruments and methods of measurement;

(4) The investigation, testing, and approval of devices used in weighing and measuring commodities in commercial trade;

(5) The technical support of State commerce to secure uniformity, equity, and effectiveness in weights and measures laws, laboratories, and methods of examination through:

(a) The establishment of operating procedures and criteria for State metrology laboratories and conduct of programs for measurement assurance, traceability to national standards, and certification thereof;

(b) The establishment of uniform inspection procedures through training programs, provision of handbooks and technical papers, and inspector certification programs;

(c) The sponsorship of the National Conference on Weights and Measures including provision of the executive secretaryship and publication of Conference proceedings and other program material;

(d) The conduct of research and development of prototype field testing devices and equipment for use by State weights and measures officials;

(e) Development and/or coordination of administrative and management systems;

(f) The calibration and verification of master railroad track scales, and the coordination of the examination of commercial railroad track scales.

(g) Coordination of state participation in national international standards and metrological organizations (OIML, ANSI, ISO, ASTM, AOAC, etc.).

C. And to the committee draft we propose changes as follows:

(a) page two change item (1) to read:

(1) Enhancing the technological and scientific base of the nation's commerce and industry by contributing to the development of basic and applied technologies which underlie product and process development, technological innovation and productivity;

(b) page eight change (a) to read:

(a) There shall be a Visiting Committee of nine members to be appointed by the Secretary of Commerce, to consist of persons prominent in the various areas of responsibility of the Bureau under this Act, and not in the employ of the Government. Two shall be experienced in state regulatory programs, two shall be expert in trade and commercial technology and processes, two shall be knowledgeable of industrial manufacturing or its management, two shall be experts in scientific research or its administration, and one shall be at large (preferrably representive of national interests.

It would be redundant for me to reiterate the long standing historical need for weights and measures programs and the original justification for Congress to establish the NBS, but I do want to testify on current and future demands for technical, legal, and administrative services by state directors.

The agency (OWM) for many years satisfied the needs of the states through calibration services (mass, length, and volume), professional and technical services, the publication of handbooks; and, most importantly, sponsored the NCWM since 1905. State officials are worried that reductions in OWM staff and the recent transfer of the Railroad Track Scale Program to FGIS is perceived as a calculated diminution of basic responsibilities granted in the organic act. Not only are these losses of service being felt at the state level, but we have accelerating needs for technological support, professional advice, and for the construction of training models.

We speak here today about problems adversely affecting state programs, and my comments and recommendations are, in the aggregate, held by most state directors of weights and measures. These concerns are also noted in the REPORT OF THE 65TH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES, Voting Key 101 "* * * NATIONAL METROLOGICAL CONTROL PROGRAM FOR THE UNITED STATES* * *

It is felt that the development of a metrological control program would benefit NCWM and its member jurisdictions in a number of ways. <u>One such potential benefit identified by the committee would be a clearer and more formalized determination of the optimum relationship between NBS and NCWM in their joint pursuit of measurement equity</u>. * * *"

State weights and measures programs are seen as being more efficient and effective than similar federal functions (vis United States Department of Agriculture, Food Safety & Quality Service; United States Department of Health and Human Services, Food and Drug Administration; Federal Trade Commission; and the United States Department of Comerce, National Marine Fisheries, etc.), but NBS/OWM support services are necessary to develop, coordinate, and maintain uniform enforcement of equity standards in the marketplace.

OWM services should be restored (and mandated) because the technology and jurisprudence of weights and measures enforcement has become exceedingly complex, and, because the scope of weights and measures has broadened to include product standards.

Within the past decade, simple weighing and measuring devices evolved into complex measurement systems; and standards calibration responsibilities (industrial and law enforcement) expanded from length, mass, and volume to include frequency, temperature, pressure, time, and EMF, and the prepackaging of commodities has accelerated.

State directors are complaining, because their needs in these regards are not being met.

[1]The actual budget for OWM has continually fallen behind in real dollar value.

OFFICE OF WEIGHTS & MEASURES (OWM)

The OWM staff should be increased to meet the mandated responsibilities to the states, NCWM, OIML, FPLA, and Prototype Approval, etc.

You all have heard the adage, "Don't work a good horse to death." That, in effect, is what is being done to the OWM staff. I know them all personally and have high regard for their professional competence, but they are all overloaded.

While the staff was being reduced, greater and new responsibilities were added, such as the prototype evaluation, grain moisture determination, and OIML.

OWM/LABORATORY AUDITING PROGRAM (LAP)

For many years the states criticized the 10-year recalibration cycle for verifying state standards (length, mass, and volume), because personnel and calibration apparatus were not examined as well. Good standards used by untrained personnel or used with faulty balances, etc. caused problems.

The LAP program now in use since the issuance of the new state standards is designed to evaluate all three (standards, metrologist, and balances, etc.), but is only being used for mass standards. To insure legal traceability of all state standards to NBS, the program must be expanded to include all standards now in use at state levels (length, mass, volume, frequency, temperature, pressure, time, EMF, etc.).

These services can only be a basic responsibility of NBS and should be provided at no cost to the states. Moreover, 15 USC 202 should provide for the maintenance of all state metrology calibration apparatus such as balances.

NATIONAL CONFERENCE ON WEIGHTS & MEASURES (NCWM)

The first director of NBS sponsored the first NCWM in 1905, which has become a living and vital organization whose aggregate efforts produced a body of technical, legal, and philosophical knowledge of weights and measures. Justification to mandate the continued sponsorship of NCWM is now greater than ever before.

Not many years ago, OWM staff could function as technical advisors to the standing committees of the conference (Laws & Regulations, Specifications & Tolerances, and Education & Liaison) and still function in other capacities. However, within the past ten years, a technical advisor to these committees has become a full-time responsibility. Required research and coordination with multiplicity of trade, commercial, industrial organizations, and other federal agencies has expanded the duties to full-time operation. Moreover, required liaison with four regional weights and measures associations (Western, Southern, Northwestern, and Northeastern) has expanded their duties. And, beginning with the 51st NCWM in 1966, the conference was frequently moved to cities other than Washington, DC, to permit a much wider participation by local weights and measures officials, industrial, commercial, and consumer organizations.

FAIR PACKAGING & LABELING ACT (FPLA)

The function of coordinating FPLA should repose in the OWM rather than in another bureau of NBS where it now lies. Currently, the technical advisor to the Laws & Regulations Committee researches the preparation of model laws/regulations relating to Marking Requirements. Consequently, we believe all similar FPLA activities should be the responsibility of that advisor

We are concerned here because we understand that the Bureau has requested to be relieved of the responsibility in this area. Especially, at this time when states are facing more legal problems effecting domestic and international trade.

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY (OIML)

Now that the United States is a signatory to the OIML treaty, we are morally bound to accept the principles thereof. Participation in these activities has added responsibilities to the technical advisor to the Specifications and Tolerances Committee and through that committee to the conference. The additional work engendered by this activity within the past few years resulted in additional burdens on the OWM, which necessitates additional staff. State and Bureau participation in this international forum to insure that our international markets are maintained in a healthy state.

PROTOTYPE APPROVAL (T/A)

A major key to insuring equity in the marketplace is the examination of new scales, meters, and other measuring devices prior to their sale to business establishments. The office of Weights and Measures conducts a voluntary examination program and issues reports of test. Most states depend on this program as an advisory service. Several states conduct their own examinations. Therefore, industry often times must request examination by several agencies. OWM is able to spend less than one man-year of effort per year on this program. With the rapid introduction of new devices employing electronics and micro processors, the current program is falling behind. It would be economically beneficial to the states and industry if the OWM program were expanded to match the growing need, especially to provide United States industry with a recognized "national program" accepted by other nations including the EEC.

ADMINISTRATIVE/MANAGEMENT (TRAINING)

State directors draw on professional advice from OWM in the preparation of legislation, regulations, programs, and budget justification. Few such agencies are sufficiently staffed to have a full body of knowledge about these subjects. Consequently, OWM should be in a position to provide such information including the capability to evaluate state programs, and prepare training models (including metrology).

All of the above is necessary to establish a base of uniform weights and measures enforcement; a concern reported in the annals of the 65th and 66th NCWM reports.

RAILROAD TRACK SCALE PROGRAM

This responsibility, long the function of NBS, was recently transferred to the Federal Grain Inspection Service (FGIS), but should be returned to OWM.

The Department of Commerce, parent agency for NBS, has far broader responsibilities than the United States Department of Agriculture, whose concerns are only limited to scales over which export grain is weighed. The calibration and certification of master railroad track scales (over which railroad test cars are calibrated and used to test all other track scales) must be a basic responsibility of NBS to maintain legal traceability of standards. The delegation of this responsibility to a federal inspection service was not to the best interest of the national economy.

VISITING COMMITTEE

We believe this committee should be structured to represent all agencies, organizations, industry, commerce, and the public depending on NBS for services. It appears that past reviews of the Bureau were conducted by scientists and the like who showed little or no concern for state weights and measures and legal metrology programs.

We hope the committee will consider our recommendations to amend the Organic Act mandating to the states without charge certain services by the Director of NBS. We believe our concerns warrant this action to continue to assist state directors of weights and measures programs to maintain "equity" in the marketplace.

> "To this end are passed all of the laws on weights and measures; for this purpose are promulgated the weights and measures rules and regulations affecting the conduct of business and the specifications and tolerances governing weighing and measuring instruments; and it is this principle that constitutes the keynote of the daily activity of the weights and measures official." NBS H-82

Very truly yours,

James R. Bird
Deputy State Superintendent

JRB:jae

Mr. WALGREN. Thank you very much, Mr. Bird. I'm new in this, so I really don't have the background to appreciate the importance of much of the functions that the NBS carries out. I just wanted to ask if you can explain a little more about the kinds of things that the National Bureau does for the States. That may seem like a ridiculous question, but there are those of us who are new to the Congress and who have never really had any exposure to a State weights and measures program. You said that NBS has been pulling back on these services over a period of time.

It has been my understanding that they still spend something like $100 million related to standards and measurement. I don't even know what that means. Obviously, if you only have 10 people in the Office of Weights and Measures and two of them are clerical, that money is going some place other than that.

What kinds of things does the State look to the Bureau to provide for it free of charge?

Mr. BIRD. I'll see if I can lay it out for you in a good order. First of all, State directors come and go. Some States have a transition every time a Governor changes, so that there has to be a body of information and experience where a State director can go and get a certain amount of training so that he can function.

The only place that he really could go is the Office of Weights and Measures at the National Bureau of Standards. This is a basic responsibility that they should have.

Another responsibility that they have had over the years and that they've done exceedingly well is to produce handbooks for the Weights and Measures officer. There is one on management and administration. There's one on the testing of weighing and measuring devices. There's one on volumetric devices. There's one on liquefied petroleum devices. There's one on farm, milk-holding tanks and the like, and this goes on and on.

It takes a great deal of information, expertise, and research to do that. As I pointed out, the latest production is a handbook that will be used by field people, on the checking of net packages. There's a great deal in here that took a lot of research to produce because they had to coordinate Federal regulations, sampling procedures, techniques, mathematical functions that are involved—that is, statistical sampling and the like.

It's becoming more complex every year, not only because of the type of things that are coming to the marketplace, but because of court decisions we have. The *Rath* case that came about in 1974 caused a great deal of this problem. They have to be able to provide technical services to us when we have to train people in our own State.

At one time, every time a State, say a Midwestern State, would change governments, everybody would go. The Weights and Measures people all the way down would go. They would have a complete change. There was no tenure or civil service or whatever you want to call it.

So that two or three of the staff from the Office of Weights and Measures would go out and train these people. However, they can't do it any more. They don't have the resources. And really, they shouldn't because why should one State absorb all of this training when other States can't get it.

And many of the States, like New Jersey, as I mentioned in another paper that I gave to you, have their own training programs that were developed in conjunction with the Office of Weights and Measures. They gave us a great deal of advice and models and the like. But as you can see, there is much more concern about training. This is quite involved. And it's no longer appropriate just to hire a man off the street and say, you're a weights and measures man. In many States now, they have laws that require police officers to take a certain amount of training before they can go on the street. This is happening in weights and measures and it has to be coordinated. It can't just be done haphazardly in every State.

We have to be able to have a question response. Certain things that come up in different States are coordinated at the Office of Weights and Measures. If you continue to try to solve your own problems all the time, you're just wasting your time. Often, when the question comes up in a State, I'll get on the phone and call the office down there and say, do you have anything on this? Has anybody else had any problem? What are they doing about it, and so forth. It's a resource agency.

Many, many times, they'll say, well, Dr. Greene in New Mexico is having this problem or somebody else is having this problem in another State. We get in touch with them and we get a consensus and work it out. A major responsibility of the Office of Weights and Measures is to supply staff assistance to the National Conference on Weights and Measures, and we can't do without it.

Mr. WALGREN. The Chair would like to recognize the gentleman from New Mexico, Mr. Skeen.

Mr. SKEEN. Thank you, Mr. Chairman. Mr. Bird, I really appreciate your testimony and your very forthright feeling about what the situation is, particularly that you mentioned Dr. Greene in New Mexico. He's a longtime friend of mine. He performs a very valuable service. I've had occasion to use the services of the State weights and measures department.

From your testimony, there's an obvious controversy about the balance that the National Bureau of Standards must reach in dealing with their commission agencies, the States, and industry. You suggest that Departments such as Agriculture should do less and the Bureau should do more, if I read you correctly.

Mr. BIRD. When I said that in the paper that I wrote, it was not so much that the U.S. Department of Agriculture should do less entirely. I said that the responsibility for the calibration of the master railroad scales should repose with the National Bureau of Standards because they are the calibration and verification people.

When you give the fox license to watch the chickens, which is what they're doing here, and I'm not saying that it's entirely wrong, but something can go wrong.

And another thing is that the Bureau spent all this money to fix up these two railroad test cars and the Federal Grain Inspection Service is only using them on 38 or 40 railroad scales that overseas export grain is being weighed on, to the exclusion of all others. As they say, 38 or 40 scales are being tested once or twice a year by them and the master scale is being done. But no other scales in the country are being done by anybody except the railroads. Maybe

they're doing a good job, maybe they're not doing a good job, but there's no official traceability to them.

Mr. SKEEN. I gather that what you're saying is that we are losing sight of what we're trying to achieve in that sector of measures and standards and so on.

Mr. Bird, in your own opinion, where would you draw the line as far as the National Bureau of Standards is concerned in terms of funding for research and development versus weights and measures? You gave me an indication that you would like to see them do a lot more.

Mr. BIRD. I don't know in dollars and cents how to break it down. But to give you an example, I think 10 years ago there were 29 people in the Office of Weights and Measures. I don't know whether that was too much or not, but 11 people today is insufficient. I'm not in a position to say how many people should be supplied for that Office. The manager of the Office of Weights and Measures should say how many people he needs for his programs. I'm convinced that if he was asked that question, he would be able to answer it. But I'm not in the position to do that because I have not discussed the situation.

But as I mentioned, many State directors and myself and others in the past few years have become concerned because of our feeling that the management at NBS is losing concern for the Office of Weights and Measures. I believe, Dr. Aston left, this philosophy started to come in that the Office of Weights and Measures was something not to be concerned with because it was not research.

And at one time, the Office of Weights and Measures went straight up to the Director's office. Now it's subordinated down to several layers. I guess that they'd have to have a petition or a resolution from NCWM to get a meeting with them. At one time, the chief of the Office of Weights and Measures had entry to the Director. It was important.

Mr. SKEEN. Well, I think it still is important. It has a tremendous impact on the consumer, for one thing, for his protection.

Mr. BIRD. I might mention, very little has been said about product standards by anyone lately. But at the quadrennial meeting of OILM in Washington here last year in June, the president that left, Dr. Von Male—they have a new one now—in his closing speech told the Europeans and the Americans and everybody around the world that it's not enough any more to be just involved in measurement science. You have to be also involved in quality of the product.

For example, you can get an exact gallon of motor fuel, precisely accurate, but if you get the wrong grade, you can have more damage to your engine than if you had short measure proper fuel. And there's a lot of circumstances in this regard today.

The commission of Weights and Measures is to maintain equity in the marketplace of the transfer of measurable commodities, so quality has become part of that equity.

Mr. SKEEN. Thank you very much, Mr. Bird. I appreciate your answer. Thank you, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Skeen. How does the National Conference on Weights and Measures fit with the Bureau of Stand-

ards? Are they in a position to pick up any of the functions that the Bureau has apparently been underemphasizing?

Mr. BIRD. No. This is my opinion. First of all, much of the work that's done for the conference, the background work, the research work, is done by the Office of Weights and Measures staff. The executive secretary of the conference is a member of the Office of Weights and Measures. The staff assistant to the respective committees are.

If we didn't have those people, we couldn't function because none of the people that go into this organization like myself have the resources to do this. The economics is not there to do it. The registration for the conference this year is $85.

Unless there was a great deal of money put into this by each of the respective States, it couldn't succeed. One thing I want to point out. The National Conference of Weights and Measures is made up of quite a few people. The electorate, if you want to call it that, are all weights and measures officers. But there are many, many other people that are involved as associate members from industry, commerce, all types of consumer organizations. We have visitors from all over the world from different weights and measures organizations, different governments.

Every year, this gets larger, because they came here to look at what we're doing because we've become known as a model of the standardsmaking organization. The other organizations in the United States have patterned themselves after us.

Mr. WALGREN. Thank you very much, Mr. Bird. We certainly appreciate your contribution this morning to our process here. If you have extra copies of those various reports, we would like to have them.

Mr. BIRD. I'll see what I can do.

Mr. WALGREN. I just think that it would be useful for the committee to have some examples of the documents that are created in the area.

[Mr. Bird's letter and one of the documents follow. Additional reports and documents of the National Conference on Weights and Measures are in the committees files.]

Mr. BIRD. I think that it can be arranged. I'll see what I can get to you.

Mr. WALGREN. Please send them to the committee, and thank you very much.

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June 19, 1981

The Honorable Douglas Walgren, Chairman
Subcommittee on Science, Technology, and Research
United States House of Representatives
Suite 2321 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Walgren:

First, I want to thank you for the opportunity to testify before the Subcommittee on Science, Research, and Technology yesterday morning. My colleagues in State and local weights and measures departments throughout the United States consider this to be a crucial period in our profession. We are relying heavily on the findings and mandates that will result from the hearings on the Organic Act of the National Bureau of Standards to provide the national leadership and assistance that is so desperately needed in the commercial weights and measures system at this time by both Government and industry.

As you requested, I have had delivered 12 copies of weights and measures publications that have been developed and distributed by the National Bureau of Standards, Office of Weights and Measures, as part of their program of assistance to the States to maintain a uniform and effective national weights and measures system. I would appreciate it if your staff could distribute a copy of each publication along with a copy of my letter to members of your subcommittee.

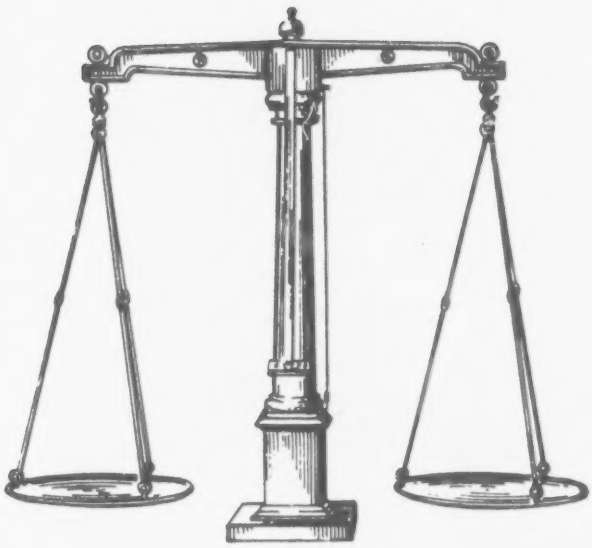
I would like to point out that NBS Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," as adopted by the National Conference on Weights and Measures is the technical "bible" in our profession. A tremendous amount of effort is required to keep Handbook 44 up-to-date with technological and marketplace advances, an example of the type of effort that the Office of Weights and Measures finds increasingly difficult to provide because of its limited resources.

I, and other officers of the National Conference on Weights and Measures, want to be of all possible assistance to the subcommittee and we urge you to call on us at any time.

Sincerely,

James R. Bird
Deputy State Superintendent, New Jersey
and Special Representative, National Conference on Weights and Measures

WEIGHTS AND MEASURES DIRECTORY 1981



U.S. Department of Commerce National Bureau of Standards

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The next witness is Mr. Kenneth Hammer, who is the past president of the Scale Manufacturers Association and is the president of Fairbanks Weighing Division of Colt Industries.

We appreciate your coming, Mr. Hammer, and any written testimony that you have will be automatically printed in the record. If you can summarize, please feel free to do so. We look forward to hearing what emphasis you would like to see made in this area.

[The biographical sketch of Mr. Hammer follows:]

KENNETH F. HAMMER

Kenneth F. Hammer is President of the Fairbanks Weighing Division, Colt Industries with headquarters in St. Johnsbury, Vermont. He is a former President, 1977–1979, of the Scale Manufacturers Association and a Director of that organization during seven of the last eleven years. He has also just concluded a three year term as member of the National Academy of Science Evaluation Panel concerned with the Directorate of Measurement Services element of the National Bureau of Standards.

Born in Seattle, Washington, Mr. Hammer was raised in New Jersey but returned to receive the Bachelor of Science in Mechanical Engineering degree from the University of Washington. He subsequently earned his Master of Science degree in Mechanical Engineering from Cornell University in 1954. During his university years, his performance was recognized with memberships in Tau Beta Pi, Sigma Xi, and Zeta Mu Tau.

Following two years of military service with the U.S. Army, he held a variety of manufacturing positions with the General Electric Company in Lynn, Massachusetts engaged in the manufacture of small jet engines. He was subsequently employed with the Computer Control Company of Peterborough, New Hampshire and Framingham, Massachusetts as Plant Manager engaged in the manufacture of high speed digital electronics with applications such as the Apollo mission simulators and the Mariner Mars on-board computer controls. Upon acquisition of Computer Control Company by Honeywell, Mr. Hammer continued and served as Vice President of Manufacturing until 1968 when he joined the Fairbanks Weighing Division as its Vice President of Manufacturing. In August of 1969, he became President of the Fairbanks Weighing Division.

Mr. Hammer is a Member of the Vermont Industrial Development Authority, Director of the Citizens Savings Bank and Trust Company, Trustee of St. Johnsbury Academy, and Member of the National Scalemen's Association.

STATEMENT OF KENNETH F. HAMMER, PAST PRESIDENT, SCALE MANUFACTURERS ASSOCIATION, AND PRESIDENT, FAIRBANKS WEIGHING DIVISION OF COLT INDUSTRIES, ST. JOHNSBURY, VT.

Mr. HAMMER. Thank you, Mr. Walgren. I'm gratified by the evidence that what we've submitted has been read. That being the case, I'll accept your invitation and considerably shorten my claims to credibility and the testimony.

I have additionally served for 3 years on the National Academy of Sciences Evaluation Panel, but I'd like to emphasize that I have great respect for the Bureau of Standards. My exposure, formally, has been limited to the Directorate of Measurement Services and the offices therein. My father spent his life in research in acoustics and electrical transmission and raised me with a sense of great respect for the Bureau. So I have that respect for its capabilities in science and research. I have virtually no professional knowledge of its activities outside the area of commercial weights and measures.

Our concerns are simply stated; they're not so simply resolved. The National Bureau of Standards is positioned to provide coordinated leadership to the loosely knit, widely dispersed and organizationally decentralized U.S. system of commercial weights and measures.

We submit that the Bureau's natural scientific curiosity and ingenuity have combined with its need to respond to legislated initiatives regarding national issues to create an unaffordable neglect of the Nation's commercial weights and measures system.

We propose you restore the significance of the Bureau's role in that leadership by restructuring consistent with other roles you feel appropriate.

A second possibility is that you remove the activity from the multiplicity of roles assigned to NBS and reposition the responsibility for weights and measures leadership elsewhere, in the Department of Commerce or in the Department of Agriculture.

The Organic Act defines the origins of our concern as early as 1901. This sentence, and I quote: "The Office of Standard Weights and Measures shall be known as the National Bureau of Standards," reveals early technical and scientific expansion encroaching on the originally intended leadership role of the Federal Government in commercial weights and measures.

In the early days of this Nation, commercial measurement was a technical problem. Thaddeus Fairbanks did not invent the practical platform scale until 1830. But today, measurement in the marketplace is not a terribly demanding scientific discipline. Measurement accuracy to 1 part in 2,000 or 3,000 is generally considered more than sufficient. The real problems lie in the areas of engineering, design economics, marketplace economics, psychology, domestic and international law, and adaptation to real world events, in addition to the considerable administrative problems that Mr. Bird referred to.

In this country, the administration of commercial weights and measures is highly fragmented, very complex and, by the interpretation of some, is outside of the constitutional authority of the Federal Government.

Weights and measures administration in the marketplace is actually done by State and county regulatory officials operating under State and local laws. A voluntary, cooperative National Conference on Weights and Measures meets annually to consider joint problems and to formulate model laws. These model laws are then enacted by the States through a variety of processes and sometimes not adopted by all jurisdictions.

It is, in a sense, a marketplace system.

The National Bureau of Standards has traditionally provided the reference basic units of measures to which all others are traceable and has provided coordinating leadership to the National Conference and to the States.

This fragmented, heterogeneous, marketplace-dominated system served this country well for over a century. Since the mid-1960's, it has faced an increasing series of challenges. They include the assertion of consumer rights, rapid advances in technology of meas-

urement product, the national dialog regarding metrication, the increasing national propensity for recourse to the legal system, the influences of the Fair Packaging and Labeling Act of 1966, the entrance by treaty of the United States into the International Organization of Legal Metrology, and the Trade Agreements Act of 1979, which adds further significance to those OIML treaty obligations.

The Bureau's leadership of the U.S. commercial weights and measures system hasn't been adequate to those challenges.

We commend the reports done for you by the Controller General and the Congressional Research Service. They describe clearly the pressures on the Bureau to serve as a reference laboratory, as a national problem solver, and as a technical and scientific leader of this Nation.

The reports clearly make the distinction between basic and applied measurement. The reports clearly identify the difficulty of the NBS management task. Congress tends to assign authority, but not responsibility. Congress tends not to fund those authorities. The Bureau has great latitude in applying broad or narrow interpretations of the authorizations.

What is not said in those reports is also of significance. While the reports to you emphasize the addition by Congress of tasks, there is no reference to congressional fragmentation of the commercial system. I believe in the 1920's, the system regarding meat products was perceived to have failed. Congressional initiative created the federalized Packers and Stockyards Administration in the Department of Agriculture. That is an entire weights and measures national effort in its own right, far bigger than all of the National Bureau of Standards efforts devoted to comparable activities in other commodities.

Later in the 1970's, Congress perceived that the measurement of grain, or rather, that the conduct of commerce in grain, was not to its liking and established the Federal Grain Inspection Service, again in the Department of Agriculture. This organization reached a head count of 1,700 people before the scope of its activities was slightly curtailed last year.

We see a picture of internal scientific and technology initiatives of the Bureau, coupled with congressionally-mandated task assignments serving constantly to reduce the National Bureau of Standards' dedication to a rational system of U.S. commercial weights and measures. The Office of Weights and Measures itself has shrunk in size from 23 people in 1968 to 10 or 11 in 1981. The Office of Weights and Measures, which reported to the Director of NBS in 1968, today is subordinated within the Directorate of Measurements Services within the National Measurement Laboratory of NBS.

So while NBS capacity is reduced, when the commercial measurements system is perceived as insufficient to the needs of the country, Congress then establishes relatively huge bureaucracies as in grain and meat. Should this trend continue to other commodities of national import, and this is speculation, like coal, we can anticipate a multiplicity of Federal bureaucracies arranged by commod-

ity coexisting with an emaciated system of State and county concern for all other items in the marketplace.

The domestic marketplace is not the only concern. In 1972, the United States, by treaty, entered the International Organization of Legal Metrology. That organization is dominated by those trained in science and deeply committed to Federal authoritarian structure. In the opinion of many, the needs and traditions of the U.S. marketplace are not always consistent with the means and philosophies of marketplace regulation adopted by OIML.

The national system, the national conference and the States, could solve national problems with resources growing out of the National Conference of Weights and Measures. But there is not unanimity of U.S. thought regarding our association with OIML or regarding the appropriateness of OIML regulation. That Federal leadership is necessary is reinforced by the 1977 Trade Agreements Act which affects world trade and presumably implies rationalization with the OIML requirements.

The proposed amendments to the Organic Act add to our concerns. The amendments to section 271 codify the conflict with science and technology, which has led to the neglect of the commercial weights and measures system and places that concern second in the list of three items.

The new paragraphs 18 and 19 in section 272 add the competing claims of disabled people and the medical and life sciences to the competition for the finite resources and management skills of the Bureau. The change in composition of the visiting committee seems favorable. We are apprehensive that the funding and charging decision prerogatives for Bureau management can further add to the scientific bias of NBS direction to the detriment of the commercial weights and measures system.

And finally, NBS oversight is with your Subcommittee on Science, Research, and Technology. That tends to increase our concern that the commercial weights and measures system will receive appropriate consideration. There are valid scientific and technological claims for your attention and that of NBS. It may be too much to ask that your committee or NBS reconcile all those claims with the needs of commerce.

We recommend that this committee seriously consider the inherent conflict and the seemingly insoluble management challenges presently facing the National Bureau of Standards. We also suggest that you consider seriously the prior actions of federalizing weights and measures activities in meat and grain products and the treaty obligations assumed under the OIML and GATT agreements. These realities exist in the presence of a domestic weights and measures system which has evolved in a uniquely American marketplace over more than a century. That system in this country faces great change of many kinds. It is without effective central focus or ability to reconcile of the domestic and international factors.

Please restore the traditional emphasis on commercial weights and measures in the National Bureau of Standards. Acknowledge the relationship between the domestic and international obligations. Assign the Bureau responsibilities and funding for this effort.

If the scientific and technology initiatives of the Bureau of Standards preclude its realistic assumption of leadership in the commercial weights and measures area, then move that effort to another position in the Department of Commerce or consider a consolidation in Agriculture which has already preempted the areas of meat and grain.

Traceability to the NBS basic standards can still be accomplished. That step is rather trivial in comparison with the economic, legal, administrative, and international considerations.

Thank you.

[The prepared statement of Mr. Hammer follows:]

Scale MANUFACTURERS ASSOCIATION, INC.

1000 Vermont Avenue, N.W., Washington, D.C. 20005 202/628-4634

TESTIMONY

Before the Subcommittee on Science, Research and Technology

Committee on Science and Technology

U. S. House of Representatives

June 18, 1981

Subject: Review of the Organic Act of the National Bureau of Standards

I am Kenneth F. Hammer, of St. Johnsbury, Vermont. For the past twelve years, I have been employed as President of the Fairbanks Weighing Division of Colt Industries. Fairbanks is the oldest U. S. manufacturer of scales and weighing equipment. It traces its origins to its founder Thaddeus Fairbanks, who invented the platform scale in 1830, a patent for which was granted in 1831.

During my twelve years in this capacity, I have also served several terms as a Director and one two-year term as President of the Scale Manufacturers Association with offices in this city. The Scale Manufacturers Association is a trade association, presently representing 27 manufacturers of scales and balances. That membership produces 80% of the scales used in trade with annual sales of $500 million and exports of $82.5 million. The Association is interested in the conduct

of equitable trade in U. S. commerce through the appropriate use and service of weighing equipment. The Association's work is largely technical in nature and provides advice to regulatory authorities.

For the past six years, I have also served as a member of the National Academy of Arts and Sciences Evaluation Panel concerned with the Directorate of Measurement Services, an organizational unit of the National Measurement Laboratory of the National Bureau of Standards.

These twelve years involvement in the weighing business have given me some understanding of mission, methods, and effectiveness of the National Bureau of Standards in its involvement with the guidance and oversight of the activity traditionally known as Weights and Measures as practiced in the commercial marketplace. I believe weighing to be representative of most measurement disciplines used in commerce.

I should emphasize that my exposure to the Bureau of Standards has given me great respect for its people and its talents. Those talents go far beyond the limits of my visibility and understanding. I do not argue against other activities of NBS but for its involvement in commercial weights and measures.

In the remarks which follow, I speak for myself, for my Company, and for the Scale Manufacturers Association.

Our concerns are simply stated. They are not so simply resolved. The National Bureau of Standards is positioned to provide coordinating leadership to the loosely knit, widely dispersed and organizationally decentralized U. S. system of commercial weights and measures. Since the mid-1960's, there have been many and

increasing challenges to that system. Those challenges include the assertion of consumer rights, rapid advances in technology, the national dialogue regarding metrication, the increasing national propensity for recourse to the legal system, the influences of the Fair Packaging and Labelling Act of 1966, and the entrance by treaty of the U. S. into the International Organization of Legal Metrology. Since the mid-1960's, the Bureau's leadership of that commercial system of weights and measures has been inadequate to those challenges.

We submit that the Bureau's natural scientific curiosity and ingenuity have combined with its need to respond to legislative initiatives regarding national issues to create unaffordable neglect of this nation's commercial weights and measurements system. We propose that you restore the significance of the Bureau's role in leadership of the commercial system by restructuring consistent with other roles you feel appropriate to NBS or that you remove this activity from the multiplicity of roles assigned and reposition the responsibility for weights and measures leadership elsewhere in the Department of Commerce or in the Department of Agriculture to which very significant comparable activities have already been moved by Congressional action.

You have several bodies of written information available for consideration. We will offer observations on the Organic Act, the report of the Controller General of April 22, 1981, and the report on NBS by the Congressional Research Service dated May 13, 1981. We will then add some observations of our own before concluding with our reaction to the proposed amendment and an expansion of our recommendations.

The Organic Act
As Amended to October 15, 1980

Section 271 reveals a 1901 origin to our concern. The sentence, and I quote, "The Office of Standard Weights and Measures shall be known as the National Bureau of Standards," reveals early technical and scientific expansion encroaching upon the originally intended leadership role of the Federal Government in commercial weights and measures activity.

Section 272, sub-paragraph (a) authorizes the development of national standards of measurement as well as the provision of means and methods for making measurements consistent with those standards in, among other things, the field of commerce.

Paragraph (d) authorizes cooperation with other governmental agencies and with private organizations. Later in Section 272, the functions authorized include number 4, and again I quote, "The investigation and testing of railroad track scales, elevator scales, and other scales used in weighing commodities for interstate shipment." Those functions are no longer done regularly by the National Bureau of Standards. Later in Section 272, sub-paragraph (d), number 5 authorizes, and again I quote, "Cooperation with the States in securing uniformity in weights and measures law and methods of inspection."

Those are the sections of the existing Organic Act about which we are concerned.

Report by the Controller General
Dated April 22, 1981

We believe this report deserves your serious consideration. It reveals many of the origins of our concern. It identifies the assignment of authorization to the Bureau, distinct from assignment of responsibility. It identifies the potential for broad or narrow interpretations of those authorizations. The report further identifies the Bureau as a reference laboratory, as a National problem solver, and as a technical and scientific leader of this nation. The difficulties of defining missions, organization, and funding of NBS are made clear.

The various sections of the report conclude by emphasizing the importance of the scientific and technical leadership needs to be met by the Bureau. Important to us is the omission of any substantial reference to the Bureau's original role in the nation's commercial weights and measures system. Adding to our concern is the fact that your Sub-Committee on Science, Research, and Technology has Congressional oversight. With all of the opportunities presented in the Controller General's report, we find it difficult to believe that a leadership mission in the U. S. Commercial Weights and Measures system and its relationship to International Trade can get sufficient attention.

The Congressional Research Service
Report of May 13, 1981

The discussion, "What is Measurement?" of the Congressional Research Service Report is of interest. A distinction is made between "basic" and "applied" measurement. Basic measurement is properly identified as the principle interest of the National Measurement Laboratory. Applied measurement is identified as the concern of the National Engineering Laboratory and the Institute for Computer Science and Technology. We believe that assuring the integrity of commercial measurements is definitely an "applied" measurement task, yet the Office of Weights and Measures is positioned within the National Measurement Laboratory.

In its discussion of "The National Measurement System" the report distinguishes between those who view the Bureau's role as technical and physical and those who advocate "balanced attention to the economic and psychological dimensions of measurement." While you shouldn't choose either extreme view, our plea is for more attention to the economic and psychological in considering the role of the Bureau in the commercial weights and measures system.

Certainly we commend your serious consideration of this report. It reveals the very difficult complexities of the management tasks facing the National Bureau of Standards. It again emphasizes the Bureau's justifiable pride in its scientific and technological capability. We will not try to argue against a national need for that capability, but we do ask that you recognize that the report stops short of discussing the lack of any coherent metrological control plan for use in the United States. Such a plan has been proposed by the SMA and is currently debated by the National Conference on Weights and Measures. The absence of NBS initiative and leadership has delayed the effective use of the considerable private, state and local, and national resources for domestic control as well as for leadership in the international area.

Our Observations

We submit that measurement in the marketplace is not a terribly demanding scientific discipline. Measurement accuracy to one part in two or three thousand is generally considered more than sufficient. The real problems lie in the areas of engineering economics, marketplace economics, psychology, the law, administration, and adaptation to real world events.

In this country, the administration of commercial weights and measures is highly fragmented, very complex, and by the interpretation of some, outside of the Constitutional authority of the Federal Government. Weights and measures administration in the marketplace is actually done by State and County regulatory officials operating under state and local laws. A voluntary, cooperative National Conference of Weights and Measures meets annually to consider joint problems and to formulate model laws. Those laws are then enacted by the States through a variety of processes and sometimes not adopted at all. We do not argue for federalization. We argue for stronger participation by the Bureau of Standards or an alternate to it in providing Federal thought, coordination, and leadership. The many State and County organizations in Weights and Measures effectively are a marketplace in their own right. They need to be understood, offered a coherent direction, and led, not governed, in the direction of a rational domestic system.

We, and the reports already cited, have referred to Congress adding tasks, funded and unfunded, to the work of the Bureau. Congress has also acted to fragment and disperse some commercial weights and measures efforts in this country. In the 1920's, the system regarding consumable meat was perceived to have failed. Congressional initiative created the federalized Packers and Stockyards Administration of the Department of Agriculture. That is an entire weights and measures national

effort in its own right, far bigger than all of the National Bureau of Standards efforts devoted to comparable activities for all other commodities. Later, in the mid 1970's, Congress perceived that the measurement of grain, or rather that the conduct of commerce in grain, was not to its liking and established the Federal Grain Inspection Service, again in the Department of Agriculture. This organization reached a headcount of 1,700 people before the scope of its activities was slightly curtailed last year. So, while Congressional initiative adds task after task to the National Bureau of Standards causing subordination of its attention to commercial weights and measures, Congress periodically acts to federalize the entire system of weights and measures by commodity. Should this trend continue to other commodities of national import, like coal, we can anticipate a multiplicity of federal bureaucracies arranged by commodity coexisting with an emaciated system of state and county concern for all other items in the marketplace.

But the domestic marketplace is not the only concern. In 1972 the U. S., by treaty, entered the International Organization of Legal Metrology, OIML. That organization was founded years earlier and was dominated by the thought of those deeply steeped in science and committee to federal authoritarian structures. In the opinion of many, the needs and traditions of the U. S. marketplace are not always consistent with the means and philosophies of marketplace regulation adopted by OIML. The reconciliation of the customs of the U.S. marketplace and the fabric of U.S. laws with the growing body of OIML regulation requires far more consideration than it is receiving. The Bureau has attempted and, considering the resources applied, has achieved considerable success in influencing OIML regulation, but there is not unanimity of U.S. thought regarding our association with OIML or regarding the appropriateness of OIML regulation. That Federal leadership is necessary, is reinforced by the 1979 GATT agreements which affect world trade and presumably imply rationalization with the OIML requirements.

Within the weights and measures community there are several current issues which are obviously too small to receive your direct consideration. They include the question of whether proper regulation is achieved by measuring the delivered product or by measuring the devices which measure the product. Another valid question is that of accuracy as it relates to graduation size of the measuring device or the precentage error of the measured commodity. Training, prototype evaluation, the voting procedures of the National Conference, and performance versus design standards are all issues of current debate. The Bureau is listening to the dialogue and trying to adopt consensus solutions. We suggest that thoughtful NBS initiatives represent the real need of the existing system.

During the period of our concern, the Office of Weights and Measures has been subordinated, from a position reporting directly to the Director of the National Bureau of Standards to its present position within the Directorate of Measurement Services which is subordinate to the National Measurement Laboratory. It has decreased in size from 23 people in 1968 to its present authorized slots of 10. At the same time, another five people have come into being for international coordination. We are not sure whether the size reduction or the organizational subordination has been most debilitating. It is clear to us, however, that the National Bureau of Standards is not taking advantage of its focal point position to gain good economic leverage from the considerable resources of the State and County governments and from the private resources presently engaged in the commercial system. Those resources could coalesce around a new center of their own making and improve the domestic scene. The existence of the OIML and GATT treaty obligations of the U.S. argue in favor of a small Federal focus of initiation and leadership.

The Proposed Amendments to the Organic Act

Certain of the proposed amendments to the Organic Act are pertinent to our concerns.

In Section 271, the additions of sub-paragraphs 1 and 3 to sub-paragraph 2 (which was moved from Section 272) merely codifies the conflict with science and technology which has led to the neglect of commercial weights and measures system.

The addition of new paragraphs 18 and 19 in Section 272 codifies the national concern for disabled people and for medical and life sciences. We view these as additional legislated burdens competing for the limited resources and management skills of the Bureau.

The change to Section 278 seems favorable to our concerns in broadening the representation of the visiting committee.

The other proposed changes may not have much affect on our concerns except that they further broaden the decision perogatives regarding charging for service. We can anticipate that a stronger scientific bias to NBS management might operate to the detriment of the commercial weights and measures system.

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Recommendations

We recommend that this Sub-committee consider seriously the inherent conflict and the seemingly insoluble mangement challenges presently facing the National Bureau of Standards.

We also suggest that you consider seriously the prior actions of federalizing weights and measures activities in meat and grain products and the treaty obligations assumed under the OIML and GATT agreements. These realities exist in the presence of a domestic weights and measures system which has evolved in a uniquely American marketplace system over more than a century. That system faces great change of many kinds. It is without any effective central focus for reconciliation of the domestic and international factors.

Please restore the traditional emphasis on commercial weights and measures in the National Bureau of Standards. Acknowledge the relationship between the domestic and the international obligations. Assign the Bureau responsibilities and funding for this effort.

If the science and technology initiatives of the National Bureau of Standards preclude its realistic assumption of leadership in commercial weights and measures, then move that effort to another position in the Department of Commerce or consider a consolidation in Agriculture which has already preempted the areas of meat and grain. Traceability to the NBS basic standards can still be accomplished. That step is rather trivial in comparision with the economic, legal, administrative and international considerations.

We appreciate your hearing of our concerns and offer our services in any desired amplification of these remarks.

Mr. WALGREN. Thank you very much, Mr. Hammer. Mr. Skeen?

Mr. SKEEN. Thank you, Mr. Chairman. Mr. Hammer, I'm very delighted to hear your testimony in this regard. I have just one question.

On page 8 of your testimony you state "That measurement in the marketplace is not a terribly demanding scientific discipline." I was just wondering—is this also true for measurement in manufacturing or in industry?

Mr. HAMMER. Certainly, it's not true in many things in industry. In semiconductor technology, measurement using light and things like that, the basic element of being able to measure is pushing the art. The commercial measurement in the marketplace is far less demanding as a standard of measurement.

Mr. SKEEN. So what you're saying is that you still have great standards of measurement or standards to adhere to in manufacturing. It's as important in that process as they are in the marketplace.

Mr. HAMMER. Yes, sir, and more technically demanding.

Mr. SKEEN. Thank you, Mr. Chairman. It sounds like the world is calling us. I appreciate this very much. Thank you, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Skeen. Do you see us really going farther and farther away from the direction of commercial weights and measurements?

Mr. HAMMER. Yes; and there are enormous resources in the private system and in the State and county efforts that are being applied to commercial administration. What the Bureau is not providing is the guiding focus and leadership. It is consuming its efforts and that of many in its constituency with attention to detail. The solutions of the detailed problem are not a part of a coherent whole. NBS is not addressing itself to the whole fabric of the control system, the underlying philosophies that will then let all of that effort have leverage and have good effect.

Mr. WALGREN. Let's assume that the Bureau was not in the last 10 years or thereabouts been distracted into some of the scientific areas, the mandated areas, and assume that they had given the kind of leadership and focus on commercial weights and measures that you feel were lacking, what would we see in the marketplace today? What would the Bureau of Standards look like? And I guess what I'm trying to ask you is to describe exactly what that different contribution would be, and what the benefits would be.

Mr. HAMMER. Speculating in the marketplace, you might see owners of weighing equipment and measuring equipment responsible themselves for its accuracy and you might see the administration of this system wherein the State and county people were checking the fact of the commodities measured, rather than the equipment that does the measuring. The private system can do that, if that's defined as the system.

The States would be administering control consistent with some overall ideas in terms of what accuracy is really required. There are no statements in this country that I'm aware of that speak to the commodity rather than the measuring equipment except for

those in the Fair Packing and Labeling Act, standard 105, to get down to the detail.

The administration by the States in weights and measures would be on the effect of the measurement rather than on the means of the measurement.

In the marketplace, you would not see a difference in the National Bureau of Standards because the National Bureau of Standards really is invisible in the marketplace today. The only thing that people depend on it for is the fact that the administrators of the field system have traceability to basic standards that are, and should in the future, be maintained by the National Bureau of Standards.

Mr. WALGREN. In your view, does the private sector have the proper incentives to make whatever advances in measuring must be made?

Mr. HAMMER. In the commercial marketplace, industry is where those advances are being made now. Changes in technology are largely derived from or derivative of other advances in other places that are further advanced technologically.

Mr. WALGREN. In a sense, you're asking, aren't you, for the Government to be out there evaluating the product, rather than focusing on putting the tools to evaluate the product in operation.

Mr. HAMMER. I hope I'm suggesting less, because I don't believe in more Federal expenditures and I don't believe in more regulation. I believe in more consistency. The seals now on scales testify to their accuracy. On gas pumps they suggest to the consumer that that's an accurate device. Those seals could still be there. The fact that they were placed there by a private sector registered person who was qualified to do it and that the State weights and measures people saw to it that the work so done was valid, by examining the output of the measurement, would really mean less presence of the States.

The States are under budget pressure, too. The States need to learn how to find less costly ways of performing the same services. But today it's not coherent. There isn't a fabric that exists that lets everybody make decisions on the small issues consistent with decisions that are being made on other issues, but subordinate to a higher kind of philosophical statement.

Mr. WALGREN. Thank you very much. We certainly appreciate that perspective.

Mr. HAMMER. Thank you.

Mr. WALGREN. There is a vote on the floor of the House that I have to respond to right now or I will miss it, so we'll take a 15-minute break and then we'll conclude with the last witness this morning.

[Brief recess.]

Mr. WALGREN. Sorry for the interruption. The next witness is Dr. Stephen Berry, professor of chemistry at the University of Chicago. We appreciate your patience and look forward to hearing your perspectives on this. Please know that your written testimony will automatically be made a part of the record. Please make what points you feel are most important in whatever way you would like to.

[The biographical sketch of Dr. Berry follows:]

DR. R. STEPHEN BERRY

R. Stephen Berry was born in Denver, Colorado in 1931. He attended school there. He received his university education at Harvard (A.B., 1952, A.M., 1954, Ph. D., 1956). He remained as an Instructor at Harvard during 1956–57. From there, he went as Instructor to the University of Michigan. In 1960 he went to Yale University as an Assistant Professor and in 1964, as Associate Professor to the University of Chicago. He was made Professor in 1967. Since 1975, he has held a joint appointment in the Department of Chemistry and the Committee on Public Policy Studies at the University of Chicago. His research has been in physical chemistry and in energy and resource allocation. His research in chemistry has dealt with atomic and molecular processes and with thermodynamics. He is coauthor of a book on the social costs of coal and nuclear power and also coauthor of a treatise, Physical Chemistry. He was Guest Professor at the University of Copenhagen in 1979, Professor Associé at the Université de Paris (11) and the first Hinshelwood Lecturer at Oxford University, 1980. He is a Fellow of the American Academy of Arts and Sciences, a Foreign Member of the Royal Danish Academy of Sciences and Letters and a member of the National Academy of Sciences. He is married and has three children.

STATEMENT OF DR. R. STEPHEN BERRY, PROFESSOR OF CHEMISTRY, THE UNIVERSITY OF CHICAGO, CHICAGO, ILL.

Dr. BERRY. Thank you very much for the opportunity to speak today. I'd like to direct my testimony now to some of the aspects of the possible revisions of the Organic Act that are not covered in detail in my written testimony.

The question you asked of the first witness suggested that I might begin by outlining a little of the background why many of us feel the Organic Act revisions are so important at this point.

The Organic Act gave the Bureau of Standards, through the Secretary or Commerce, six functions, of which four are explicitly standard-related. One of the other two refers to advisory service to Government agencies and the other, to the invention and development devices, processes, that would serve special needs of Government.

It's really through these last two that I think there's been a growing perception of conflicting roles that the Bureau might be forced to play. A lot of the tension about the Bureau is over these roles. On the one hand, it has its role as a generator, guardian, distributor of standards, and the other, it acts as an advisor to Government and a helper to Government and private industry in general.

The conflict, as I've described it, is spelled out in much more detail in the CRS report, the GAO report and the OTA report, all of which you are fully aware of. Actually, I had some hand in that 1978 OTA report myself, when I was on the OTA panel studying national laboratories.

It's important, I think, to distinguish between those functions that NBS in particular must carry out, the standards tasks that have become necessary to the functioning of our society, and those functions that would be of benefit to us if done, but are not necessary in the same sense as the first category.

I've addressed some of my written testimony to that distinction and particularly to the unique role that the NBS plays in the United States.

Now let me turn back for a moment to the question of the perceived conflict in the two roles of the NBS and the relationship that that has to your considerations of revising the Organic Act. It seems to me that one could resolve that perceived conflict in the

revision of the Organic Act in either of two ways. The Organic Act could be restated to make it clear that the assistance that the Bureau of Standards provides to other Federal agencies is intended to be in the areas of special competence of the NBS, which implies the areas of its own title, the areas of standards. Alternatively the Organic Act could be restated to clarify the priorities of the Bureau's roles. The Bureau's unique role as the generator, guardian and distributor of standards might be given explicit top priority in such a way that the Bureau could take on other tasks so long as they did not inhibit or retard the performance of the special, unique role that the Bureau performs.

Now I won't try to go through the illustrations that I gave in my written testimony to show how the Bureau's role has been unique in commerce. I chose in those examples to focus on cases where the work that the Bureau had done would be called basic research or research on basic standards, scientific standards. I didn't bother with examples from the more mundane side, from the Office of Weights and Measures side, for example. I took those for granted, as a matter of fact, as being self-evidently critical to commerce in America. Rather, I chose examples that illustrated activities I saw as more vulnerable but at least as critical. Perhaps in light of the earlier testimony this morning, I should have chosen some examples in weights and measures as well.

What I hoped to show with those examples was that our society is so deeply committed to living with high technology in industry and commerce, that seemingly arcane tasks like determining the speed of light to eight significant figures, are, in fact, crucial to our everyday existence; that is, if there weren't somebody at the Bureau of Standards laboratory in Boulder determining the speed of light to eight significant figures, we couldn't locate satellites to 1-meter accuracy. Determining the speed of light to ever greater accuracy seems like a very arcane measurement, but it is, I suspect, important to national security. Scientists at NBS have had to do real scientific development just to have the capability to make that measurement.

I chose another example—having to measure frequency standards and frequency purity of radio waves to a part in 10 to the 12th in order for television networks to be able to share equipment. Without standards that lock transmission equipment into that level of accuracy, networks couldn't share equipment or broadcast the same picture with split images over several networks simultaneously.

I tried to give a number of positive examples that show where activities of the Bureau made, in almost every case, a yes or no difference between some commercial venture happening or not happening.

I tried also to pick out a few negative examples, situations where cutbacks in the Bureau's programs had somehow inhibited, retarded, thwarted some significant commercial development or development in a government mission agency.

The second kind, the negative examples, of course are harder to come by. People are reluctant to talk about those, even though they are the ones that we learn more from.

Since I prepared that written testimony, I have found a couple of other examples that I thought I should bring to your attention. I had a long conversation with the director of corporate research and planning of Westinghouse, John Holm, who pointed out to me how the development of superconducting magnets has depended critically on a seemingly arcane effort carried out by the Bureau, through its funding of a man who works at General Electric. The man doesn't work at the Bureau. He's in private industry. But what he does is to compile data on the critical temperatures and critical fields of superconductors; that is, he collects and disseminates data from all the people working in the field of superconducting materials about the temperatures at which they become superconducting and the magnetic fields below which they could be superconducting.

In other words, the information he collects tells us how strong a superconducting magnet one might make.

That particular task, which is carried out under the National Measurement Laboratory, the more "pure" side of NBS, was absolutely necessary for the development of the superconducting material niobium aluminum germanium, which is the only superconducting material that works at the temperature of liquid hydrogen. All other superconducting materials require liquid helium, which is a much more expensive material coolant than liquid hydrogen.

Without this Bureau effort, the table of properties of superconductors would never have been developed. Dr. Holm was absolutely convinced that without that table, this superconducting material would never have been discovered.

Again, he gave me another example from efforts in the National Engineering Laboratory, a second side of the Bureau, where there is continual tabulation and actual determination of the physical properties of superconductors—this happens to be Dr. Holm's field—and insulating materials, particularly the behavior of both of these under stress.

You can build a superconducting magnet and turn on the electrical current through the coils. The magnetic field that builds up deforms the magnet and produces enormous stresses. Much of the question of success or failure of these magnets is based on whether the materials can withstand the physical stresses without breaking.

Here was a case where a broad, long-term NBS study of properties and materials has been absolutely vital for the development of superconducting magnets. Without this information, we would not have the kinds of superconducting magnets that we now have.

Without the support of the Bureau, without the support of the Federal Government, neither the tables of critical fields in temperatures or the assessment of the materials under stress would have come into being. Neither of these is an activity that a private industry could justify.

This brings me to an important second point. Both contributions are examples where the public benefits are enormous and the private benefits that could be captured by an individual firm who developed those bodies of data would be very, very small. The expense of setting up the laboratory, the expense of collecting all of the data, plus the fact that the data would quickly become available to every other firm in the field, make this essentially public

information whose value and whose benefits are too broad for an individual firm to justify.

It's a paradigm of the situation in which one can justify Government investment rather than private investment, even from the viewpoint of my Chicago economist colleagues. The total benefits are large but no private firm can justify doing the research.

And yet, without it, we would all be much worse off.

Mr. WALGREN. But then the question comes as to how you select the areas of investigation.

Dr. BERRY. That's right.

Mr. WALGREN. And whether or not having that kind of range of responsibility undercuts the other functions.

Dr. BERRY. That's a very good point. We worry about that. The Bureau worries about it, too.

When you look at the standards activities—that is, the systematic determination of the properties of materials—and let's go to the extreme of determining the speed of light or wavelength standards—these are really activities that require a kind of dedication and skill and commitment of time that really isn't appropriate to universities. Our business in academic research is the generation of new scientific information, but we do it very much through the apprenticeship system—through students and postdoctorals.

Our people come and go. In fact, if they stay too long, we worry. You need people to develop these standards who become extremely skilled in those special techniques, who can stay at the frontier in that subject, but—I just could not imagine in my own laboratory setting up anything like the high precision studies that are carried out at NBS–JILA in measuring speed of light, even though I work with lasers all the time. I wouldn't trust the speed of light measured by even my best students the way I would trust the speed of light measured by Jon Hall.

There has to be a kind of impeccability, a kind of very, very special reliance on these people and the Bureau has this. This is one of the things that makes them so unique.

You are correct that there are many tasks that may not be especially right for the Bureau. In fact, I would like to urge you in examining the revision of the Organic Act to raise this question: what is the Bureau's role among all the national laboratories? And should we be mandating some of the things to other national laboratories that are being mandated to the Bureau? Are we spreading the Bureau too thin? Are there are other laboratories that could better do things that the Bureau is being asked to do?

Certainly, we have a set of national resources and very, very high skills in all the national laboratories, not only the Bureau. Perhaps some of these skills are being underused at other national laboratories at a time that we're overstressing the Bureau, giving it things, that it could do well, but not things that it could do uniquely.

I would very much like to see the Organic Act revision conducted with cognizance of those other laboratories and of the roles that they could play. They also, I think, should be able to provide advisory services to Federal agencies, to use the wording of the GAO report that describes what the Bureau is called upon to do.

Let me use this to bring my remarks to a conclusion now. It has been suggested sometimes that the Bureau of Standards might function more effectively if it were not part of the Department of Commerce. I know that Congressman Brown has suggested that it might be included under a national technology foundation.

One can apply that line of logic to all the national laboratories. One may ask, how can we get the best performance out of these laboratories in terms of doing service to the Nation?

To achieve that, one might consider whether it's advantageous to have these national laboratories working, not for parent agencies but with parent agencies. It might be that in the long run, this committee might consider the establishment of a national laboratory administration, in which not only the National Bureau of Standards, but Los Alamos, Lawrence Livermore, Argonne, Oak Ridge, Brookhaven, all could be part of the national resource on which Congress and the Federal agencies could draw.

In that kind of an environment, the Bureau could function to perform its own unique standards roles, all the way from the most mundane weights and measures standards to the most esoteric. And then other functions, not necessarily so directly standards related, could be allocated among all the national laboratories, according to their own special strengths.

With that suggestion for the long term, I'll be happy to entertain any questions.

[The prepared statement of Dr. Berry follows:]

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Congressman Walgren, Gentlemen:

Let me first thank you for the opportunity to appear before you, to discuss the Organic Act of the National Bureau of Standards and the role and functions of the NBS. I have, during my scientific career, had many, many interactions of many kinds with the NBS. My first graduate student and one of my first postdoctoral associates both began their own careers as scientists working at the Bureau and now hold rather senior positions. I must talk with Bureau scientists on the average of at least once a week throughout the year, so I have a moderately up-to-date picture of some of what is going on there. As a member of the Numerical Data Advisory Board of the National Research Council, I see some of the Bureau's activities on a systematic basis. As you may suspect, I have formed strong views about the NBS; I hope they will be useful to you.

Like all my fellow physical scientists in academic research, I look up information virtually every day in some NBS book or pamphlet. Without this fund of data evaluated, compiled and largely generated by the staff of NBS, we could not carry on research as we now do. But I do not wish to expand further on this aspect of the Bureau's function except to let you know that basic science in universities would slow to a crawl if we had to generate or verify the physical information supplied by the NBS.

The main thrust of my message is this: the National Bureau of Standards, as the prime generator, custodian and distributor of basic standards, fulfills a unique and critical function for the health of commerce in the United States. Any change in the nature of the National Bureau of Standards

that erodes its abilities to carry out that function is a potential threat to American enterprise. Any changes in the Organic Act of the National Bureau of Standards must be scrutinized first in terms of how they will affect those unique and critical things that the Bureau does.

The NBS does many things that are valuable to our society and there are surely many other jobs it could take on that would bring even more good to us all. It is surely possible to improve the workings of the Bureau and revising its Organic Act may well be one good way. But I reiterate: the substructure of our technological economy is totally dependent on having a body of reliable scientific information, often information of an accuracy that boggles even the minds of physical chemists like me. The supplier and keeper of this information for this country is the NBS. This role of the Bureau is unique; no other agency, public or private could fill that role without becoming a copy of the Bureau. And this role of the Bureau is so essential to our economy that even tiny reductions in that role can, in some instances, raise terrible problems for American commerce.

In the following discussion I shall try to make four points. First, by a series of illustrations, I hope to show that the National Bureau of Standards, by performing its unique function of generator and keeper of basic scientific standards, plays both a continuing role without which a variety of aspects of commerce could not go on, and a special role in making possible the frontier developments of technology. These are all positive examples, to show the kind of unique good service the Bureau

provides when it is functioning well. My second point is that when the Bureau is impeded from performing that function, there are negative effects on the economy, and that sometimes we can track down these effects and see how bad they are. Naturally it is much harder to get people to talk about situations that went badly than about situations that went well, even though we may learn much more from the former than from the latter.

Third, I would like to make a point about the evolution of the special niche and scientific stature of the NBS. Finally, I shall try to synthesize from the first three points some implications regarding the proposed changes in the Organic Act.

NBS in the Furtherance of U. S. Commerce

The following cases are some of the examples I collected by talking with a number of scientists, most of them in industry. Each is intended to illustrate something that only the NBS can do, without which some commercial or technological advance could not have happened or would have been delayed for at least a few years.

(1) To make it possible for there to be a large number of television channels, it is necessary for several stations to operate on the same channel. If two broadcasters using the same channel are moderately far apart, viewers near one station or the other get clear signals. However viewers in fringe areas see patterns of light and dark that may disturb the picture severly. By careful selection of the frequencies of their carrier waves the two stations can broadcast so as to make this "cochannel interference" negligible. However the carrier waves must be selected to about one part in ten billion (one in 10^{10}) and held stable at those

frequencies. The NBS not only plays the role of standard-setter for the frequencies and the stability of those frequencies; it literally developed from its basic science of statistics the conceptual standard for frequency stability of oscillators and clocks. From this conceptual standard, it was possible to develop physical standards for the carrier wave frequencies.

(2) A second example from television: when television networks share facilities, the video waves must have precisely the same frequency and phase. That is, the video frequencies of the sharing networks must be the same to within about one part per 100 billion (1 in 10^{11}) or per trillion (1 in 10^{12}). Television companies buy and use atomic clocks to maintain this stability. The NBS calibrates these clocks and publishes their frequencies, measured to a part in 10^{12}. Furthermore the basic research of the Bureau showed how the signals from the atomic clocks of TV stations generate super-accurate signals in ordinary television sets which are now being used commercially as time and frequency standards where ultrahigh accuracy is required.

(3) One of the activities of the NBS that appeals to physical scientists is its determination of the speed of light. One might ask why it is important to determine this quantity to one part in 100 million. Here I can only conjecture. However I can do a few quick estimates, knowing about how high satellites fly above the earth and about what accuracy is claimed in the public press for satellite-to-earth navigation, and conclude that the control of our most accurately guided devices must depend on knowing the speed of light to about a part in 100 million. In other words, I piece together information that tells me that a "pure" measurement such as that of the speed of light carried to highest accuracy is crucial for our defense systems.

(4) The basic standards work of the Bureau played a very important role in the management of air quality, particularly regarding nitrogen oxides. In 1974-75, the NBS developed a device called a permeation tube, for nitrogen dioxide (NO_2). With this device, the Environmental Protection Agency was at last able to evaluate its reference method for determining the amount of NO_2 in the ambient atmosphere. The data from this reference method had been used to set primary air quality standards and to project the concentrations of nitrogen dioxide in the various air quality regions to 1985. The projections had indicated that some 40-50% of the regions would not be in compliance with the air quality regulations in 1985. On that basis, the Administrator rejected the state implementation plans of those regions. However when the NBS permeation tubes were used to check the reference method, that method was found to be severely in error, in a nonlinear fashion. When the corrections were made, and the new projections were generated, the regions thought to be noncomplying turned out to be in compliance. The rejections of the implementation plans were of course rescinded by the Administrator of EPA and the public was saved a great deal of expense.

(5) The helium-neon laser is probably the most wisely used laser in the world. One can buy a little one to use as a straight line to construct a sewer. We use its red beam every day in the laboratory to check the alignment of optical systems. One of the inventors of this remarkable device told me how he and his colleagues at Bell Laboratories depended totally on having the Tables of Atomic Energy Levels--we refer to them as "Charlotte Moore's Tables"--to invent that laser. The invention was

accomplished in 1960; the Bell management was getting impatient, I was told, and the work was not going well. The one table of atomic spectra previously available generally in the U.S. that contained the crucial frequencies gave an erroneous value for the most crucial frequency. But then when Charlotte Moore's Tables became available, everything fell into place and the device worked. Without these Tables, this device might well have never been created; its combinations of energy levels are too complicated to be the kind of thing one finds by casual searches.

(6) The argon ion laser, too, depended critically in its development on the same tables. This laser would probably have been invented without Charlotte Moore's Tables but one of its inventors estimates that having those Tables saved at a least a year of development time.

(7) The development of modern microelectronics depends very heavily on knowledge of the thermochemical and thermophysical properties of materials. For example work at IBM on oxidation and epitaxial growth, particularly of binary semiconductors, leans very heavily on NBS data. Information from NBS regarding diffusion properties was crucial for the frontier achievement of the fabrication of a line only about ten atoms wide; the ability to make things like this line will enable us to create microcurcuits of the smallest possible size. The studies of the late Bernd Matthias on high-temperature superconductors relied very heavily on both atomic and solid-state data from the NBS.

(8) Another facet of NBS basic standards work was crucial to semiconductor development. Gallium arsenide is becoming more and more important as a semiconductor because it is easier to switch than silicon and has much

smaller heat losses. However fabricating gallium arsenide requires working with arsenic vapor, a substance that attacks most thermocouples. And of course it is very important to know and control the temperature of the arsenic vapor. The NBS developed and now calibrates and supplies the one known kind of thermocouple that will withstand arsenic vapor, the tungsten-rhenium thermocouple.

(9) Some properties of surfaces can only be studied by shooting relatively low energy electrons at those surfaces and seeing how the electrons are scattered. To do this usefully requires knowing how far the electrons of a given energy penetrate into a solid. The NBS had made such measurements, collected others, compiled, evaluated and published them. These data have been vital for the diagnostic studies of surfaces being done now, for example, at IBM.

Some Cases of Thwarted or Retarded Progress

The examples just given are all intended to show how the maintenance and advance of our technological commerce depends on the basic scientific standards work of the NBS. Now we can examine a few cases in which the Bureau has been unable to maintain ongoing basic standards work and a commercial or governmental project has suffered as a result.

(1) Several cases can be traced to the reduction of effort in atomic and molecular spectroscopy. A simple example that arose when a researcher at IBM wanted to study the properties of surfaces by the electron bombardment technique mentioned previously, but with atoms bound weakly to the surface. This work was thwarted because the required energy levels of atomic krypton and intensities of the spectral lines involving these levels

were simply not known. The NBS had been engaged in a systematic program that would have supplied this information as a matter of course, but that program had been cut to a bare minimum by the time these data were needed.

(2) Another program that was severly retarded because of the reduction of effort in the Bureau's program in atomic spectroscopy was the nuclear fusion energy effort. For about six years, it was known that some Tokomak-like devices were losing very large amounts of energy by processes not included in the original plans. The largest part of the anomalous losses was traced to radiation, but nothing could be done to eliminate it until the source of the radiation was found. Had the NBS program in atomic spectroscopy been up to strength, the people in that program could have rather quickly solved the problem. As it turned out, the problem was eventually solved by people from Argonne National Laboratory and Los Alamos Scientific Laboratory, at the cost of starting new small programs specifically to study this problem. The result of the cutback in the NBS work was the cost of training people and setting up new programs for a job the old NBS group could have done almost routinely, plus the cost of several of those six years of delay. The answer, by the way, was that the radiation was leaking out in light from thousands of lines of the spectra of various ions of tungsten. Now the inner walls of Tokomak-like devices are made with no elements heavier than iron.

(3) Another area where the continuing basic standards work of the Bureau has been cut back to the visible detriment of the scientific community is in the determination of thermochemical and thermophysical properties of matter. Previous examples showed how this program can work positively.

By contrast, the preparation and determination of electronic properties of gallium arsenide and other related semiconductor materials depend crucially on having at hand knowledge of thermophysical and thermochemical properties of compound semiconductors. Providing data about these properties would have been an easy and natural task for the thermodynamics group when it was operating at strength, The sharp reduction of the Bureau's programs in thermodynamics, thermochemical and thermochemical properties has cut off the generation of such data at NBS. The result has left the semiconductor industry without a crucial stream of information on which its development of new technology had depended.

Furthermore the needs for such information will not be diminishing. New materials are more complex than old ones; they require more information for their creation and to get that information requires ever higher scientific skills. The most efficient photovoltaic material I have heard of is gallium aluminum arsenide; its photoconversion efficiency is apparently 27%, quite a remarkable figure. But this requires a substance made of three elements, not one or two, so its preparation requires knowledge of the thermochemical properties of 3-element mixtures over a range of compositions and temperatures.

(4) Another area in which the reduction of the NBS's programs in systematic generation and compilation of thermochemical and thermophysical data has retarded commerce is in the fossil fuel industry, particularly the generation of liquid and gaseous fuels from coal. M.A. Albright of the Phillips Petroleum Company prepared a statement of research needed in this field; this document contains some eleven classes of data necessary for inventing ways to obtain "synfuels" in practical ways from coal. Some of this research could be conducted by the research laboratories of large corporations, but

most of it, such as the studies of high-temperature thermochemical and thermophysical properties of the heavy hydrocarbons, the analysis of chemical equilibria of such substances at high temperatures and the reliable measurement of properties at high temperatures are among the critical kinds of data whose determination is precisely what the NBS does better than any other group.

The Special Role and Status of NBS

The systematic generation, collection, analysis and distribution of basic scientific standards sounds to many of us like a routine task. It is true that such work requires a willingness to be meticulous, to challenge and check and recheck at every stage. However it is not the static, assembly-line repetitive work that one might naively expect. To measure the properties of each new set of materials usually requires the development of new methods and of proving their reliability. Let me give one of my favorite examples to illustrate this.

The determination of frequencies and strengths of the spectral lines of atoms and molecules has been one of the traditional tasks of NBS. Other laboratories have occasionally added information to that generated by the Bureau, but a very large part of our ultimate information of this kind has been generated at NBS, particularly for atoms and small molecules for which high precision and accuracy are required. Obtaining such information for some normal atoms and molecules required skills not very different from what many of us use in our own laboratories in universities and industries, but honed to much higher precision than we normally need them. However to obtain data for highly ionized atoms, for example, required the development

of new skills and techniques. Even the study of normal atoms of involatile substances required the development of new scientific tools, the special "heat pipe" ovens, with which the scientist can determine accurately the amount of material he or she is observing.

It is important to know not only the kinds of excitation that can be generated directly by absorption of light. Atoms and molecules have many ways of storing excess energy in states that can only be reached by other processes such as collisions with electrons or heavier particles. Knowledge of these "forbidden" states as they are called is crucial to the understanding of properties of matter at high temperatures and of atmospheres. The NBS had a program for some years that pioneered the scientific and technological development of the tools, experimental and conceptual, for the systematic study of the excitation of isolated atoms and molecules by electron impact. The work was unquestionably unsurpassed throughout the world in its scientific quality and brought considerable attention to the Bureau. The techniques for systematic exploitation of the method were nearly developed when the NBS reduced the scale of this effort. During the next few years the level of the Bureau's effort on electron impact spectroscopy dropped essentially to zero. Here is an area where there is a clear but not frantic need for the data now, strong reason to believe the needs for such data will grow, the requirement of great skill and commitment on the part of the researchers and a willingness of the laboratory to sustain a long-term effort, if the method is to be exploited for the systematic information it can yield. This, to me, is an example of a program that will pay for itself in public benefits even if there is never a sudden acute need

for the information. However if there were to be a sudden need to generate the special information that this technique provides, it would be very expensive to have to start anew, training scientists unfamiliar with the high skills required and constructing or refurbishing the high-precision equipment. In short, in systematic data gathering by methods requiring very refined skills, it is often cheaper to maintain an existing program than to gamble and have to recreate the program when someone has urgent need for the data.

The examples of thermochemical and thermophysical data, atomic and molecular spectra and the accurate measurement of the speed of light and other fundamental constants are all kinds of information whose benefits are public, rather than private. There is no way for a private firm to exploit for profit the generation of a table of atomic energy levels. Consequently there is no incentive for a private firm to undertake the task of creating such a table. Yet I hope my illustrations give convincing arguments that there are large public benefits from the availability of these tables. They pay for themselves many times over in the new goods and improved services made possible because we have such data. Put explicitly, there is a public benefit from the gathering of basic information and standards that justifies the expenditure of public funds, and that would not exist if private investment were the only possible source of that information.

The foregoing is a rather familiar argument to many people concerned with science policy and the role of public spending for scientific research. There are two further aspects of the argument that are not so frequently considered, and that are especially relevant here. One point is that there is much research inappropriate for Federal support and inappropriate to the

NBS because it has a large potential component of private benefit and therefore should be carried out by a person or firm who can capture those benefits. It might be useful for the Subcommittee on Science, Research and Technology to examine programs mandated to the NBS by Congress between about 1965 or 1970 and 1980, applying the criterion of relative amounts of public and private benefits and then using the results to formulate new criteria to help decide whether a program should be supported entirely by public funds, partly by public funds or entirely by private funds, and thereby to help decide whether a project is appropriate for NBS.

My discussion has been primarily of activities whose benefits are entirely public. When looking at this set of activities, we should go to the third step of this line of logic, and ask what are the benefits and costs of not continuing any particular program of basic standards work. The "negative" examples I gave of problems incurred because of cutbacks in basic standards work provide some first insights into what the direct parts of these costs may be. However the total costs may be somewhat more extensive. Our society has become so deeply committed to living with high technology that we are like Alice and the Red Queen: we have to run as fast as we possibly can just to stay even, and if we want to get anywhere, we have to run twice as fast. Our society could not exist without growing bodies of wavelength and frequency standards, standard sets of chemical and physical properties of materials, even standards for defining the substances we are using. This nation cannot stay even without running hard to maintain its scientific and technological abilities. I hope I have persuaded you that one of the unique pillars of those abilities is

the body of knowledge generated, held and supplied by the National Bureau of Standards. We cannot afford to let this institution weaken.

Yet we have seen the NBS grow weaker during the period 1955-1980. When I completed graduate school in 1956, the NBS was one of the few places to which faculty would normally recommend their best students. That is certainly not the case now. I would certainly urge my top students to work with some individuals at the NBS, but I would not make a blanket recommendation to a top student, saying "If you can get a job at the Bureau, take it." This is in part a reflection of the caliber and the importance of the activities carried out by physical chemists at NBS in 1960 and in 1980.

One other question sometimes arises regarding frontier research and basic standards work at NBS. That is the question of whether universities would be more appropriate settings. There are some examples where university scientists have done work that the Bureau could have done and would have been proud to do. There are overlaps. However a university research scientist has a responsibility to train students, and therefore has a steady flow of people passing through his laboratory, each staying for only a few years. These students are apprentices in the most traditional sense; they come knowing very little and they learn by doing. They are ordinarily not the kind of researchers one would like to have doing work on basic standards. For that work, one needs sophisticated and dedicated people with great technical skill and experience and considerable scientific insight. University settings can hardly be counted on for such qualities.

Implications for the Draft Amendments to the Organic Act

As one can tell from my comments, I am far more concerned about possible erosion of the ability of the NBS to function as the keeper of basic standards than about its ability to contribute to the development of basic technologies which underlie product and process development. Before calling for the spending of any Federal funds for the development of technologies for product and process development, it is important for Congress and its Committees to estimate the relative amounts of private and public benefits that would accrue from that basic process development. Only if the public, uncapturable part is relatively large can we justify spending public funds for the work. This evaluation, by the way, must not be done too naively; there are sometimes public benefits to accelerating some development that would be carried out eventually with private funds alone.

Then, if it has been decided that public funds can appropriately be spent for a project, the Congress still must ask how those funds should be spent. It may be tempting to call upon the NBS because it is close by and well known to many members of Congress. However there are many other National Laboratories with great skills in developing "the basic technologies which underlie product and process development, technological innovation and productivity." In many instances, I suspect that other National Laboratories could do jobs of this sort better than the NBS and that those jobs should go to the other Laboratories. In short, I have reservations about the proposed item (1) for paragraph 271(b), in the proposed amendments. The 1980 reports from the GAO and the CRS and the 1978 OTA report all make

reference to the problems created at NBS by having tasks mandated to it that have reduced the capacity of the Bureau to carry out its basic standards functions. I am so concerned about how vital that basic standards work is to the health of this nation that I wish to see it protected even it it means that the Bureau's total responsibilities are narrowed.

Regarding the proposed addition to paragraph 271(b)(3), this section is stated so generally that it could, on one hand, put the Bureau into the position of being a Government-sponsored consulting agency, available to anyone who needs tecnnological help. On the other hand, it might be interpreted to mean that the NBS has the mandate to take initiative in choosing national problems for which its skills give special insights, and offering its information and counsel regarding those problems. If the former meaning were given to this section, the consequences could be a disastrous dissipation of the Bureau's skills and disappearance of the vital basic standards activities of the NBS, with consequences of the worst sort. If the second meaning were the one intended and applied, the results could be very happy indeed. Scientists are independent and proud individualists who perform best when given a great deal of personal initiative. Allowing NBS to take initiative would go far to raise the morale of a laboratory where the atmosphere has become more and more glum over the past decade.

The National Bureau of Standards is a keystone in our technological enterprise. Its primary importance derives from its unique role as generator, keeper and distributor of basic standards. All its other roles, however useful they may be, are not unique to the Bureau. In revising or amending the Organic Act, this Subcommittee, the Committee on Science and Technology and the Congress should keep this idea foremost.

R. Stephen Berry
Department of Chemistry
University of Chicago

83-040 O—81——15

Mr. WALGREN. I can see that there's a relationship between what's done in those laboratories and much of the direction in which the Bureau of Standards has been pushed, and which we'd like them to pursue because we want the benefits. But when you hear testimony that the Bureau is not performing well some of the basic functions that we know we ought to have them pursue, then the question comes whether they can do both. I don't know the answer to that.

Do you have any feeling for the spinning off of functions to the private sector by the Bureau of Standards? It is my understanding that the Bureau attempts not to maintain the responsibility for certain functions if the private sector picks it up or is there to pick it up.

Dr. BERRY. No. I think this is a very healthy thing. Some of the techniques and devices that they developed for air quality management, for example, were very, very natural for the private sector in the sense that, once invented, once proven to do the job of helping regulators, it was clear that lots of these devices were going to be needed.

And in the absence of an emergency, it seems absolutely natural to then pass that on to the private sector and let them be manufactured, let the entrepreneurs step in at that point, and let the Bureau scientists go back to their lab benches.

No, I think that that has worked very well and I think that it has been a very healthy interaction, not only at the Bureau, also at other national labs. Sometimes, people from the private sector come in and work at the national lab for a while to learn the basic techniques, and then go off and adapt them for manufacturing.

Mr. WALGREN. But it seemed to me that some of the witnesses this morning were saying that they wanted the Bureau to provide certain services to them without charge.

Dr. BERRY. Well, I suppose I might take issue with that phrase, "without charge." That is, there are functions in which it's impossible to charge, where the service is so diffuse, that there's no way to define a charge, or where it would be more costly to define the charge than to collect it.

But, in general, when the service is specific, I see no problem with asking the Bureau to charge. I think the Organic Act allows for this now. Certainly, when the Bureau prepares wavelength tables, it sells these wavelength tables. It doesn't give them away; I don't think it should give them away. It doesn't do it at profit, but it does or should make up the direct cost.

Mr. WALGREN. The services for the States strike me as being very different than the work done in a research laboratory, per se.

Would it make sense to you to move that kind of service, particularly calibration, out of the Bureau of Standards to some separate place?

Dr. BERRY. There really isn't in practice a sharp distinction; there's a continuum. That is, there are regular services of, say, checking scales. There, I could imagine moving it into the private sector, saying, let's check the certifiers, but let the certifiers be commercial. But then, there are the calibrated thermocouples that the Bureau supplies, not frequently—in fact, so infrequently, you couldn't possibly make a commercial venture out of it—but every

once in a while, somebody needs a platinum iridium thermocouple to measure what's going on in a high-temperature system. And in that case, the Bureau currently will calibrate one and sell it at cost. I think that's fine.

It seems to me that these have to be judged on a case-by-case basis. One might ask whether the balance has shifted too heavily toward the Bureau being a commercial server. But I think that, inevitably, there will always be cases where the Bureau has to act as the vendor of some specialized standard service.

Mr. WALGREN. I see. Thank you very much, Dr. Berry. We certainly appreciate your views on this. That ends the hearing process and this review. We'll look forward to trying to digest the suggestions made and see what directions the committee feels it's helpful to go in.

Thank you very much.

[Whereupon, at 12:10 p.m., the hearing was adjourned.]

APPENDIX I

STATEMENTS SUBMITTED FOR THE RECORD

STATE OF CALIFORNIA — EDMUND G. BROWN JR., Governor

DEPARTMENT OF FOOD AND AGRICULTURE
1220 N Street
Sacramento, CA
95814

JUN 30 1981

June 12, 1981

Honorable Doug Walgren, Chairman
Subcommittee on Science, Research
and Technology

We would appreciate the following information being entered into the record of the Oversight Hearing on National Bureau of Standards, July 16, 17 and 18.

RECOMMENDATION

We recommend that the United States Department of Commerce, National Bureau of Standards, restore their Office of Weights and Measures staff to their 1970 level of 29 employees.

BACKGROUND

Weights and measures laws in this nation are largely promulgated and enforced by the individual states and, in some cases, local jurisdictions. There are approximately 3,000 state and local officials nationwide involved in weights and measures enforcement. The dollar amount of commerce that is regulated is difficult to perceive, but the sum runs to the billions of dollars.

Existing Federal law authorized the National Bureau of Standards to cooperate "with the States in securing uniformity in weights and measures laws and methods of inspection". Non-uniformity in such areas is extremely costly to industry and consumers.

Since 1905, NBS has done a remarkable job, primarily through the sponsorship and support to the National Conference on Weights and Measures, in securing uniformity in state and local weights and measures laws, regulations, and methods of inspection.

Recently, however, NBS has steadily reduced the resources devoted to the coordination of this important activity. Resources have been reduced by 66% since 1970.

In view of the National Bureau of Standards multi-million dollar budget, it would take very little redirection of resources to properly fund activities that are of benefit to all the people of this nation.

Hans Van Ness
Deputy Director

cc Committee Members

Maine Department of Agriculture

JUN 22 1981

Stewart N. Smith, Commissioner

DIVISION OF REGULATIONS
Clayton F. Davis, Director
State House Station 28
Augusta, Maine 04333
Telephone 207/289-3841

June 19, 1981

Representative Doug Walgren, Chairman
House Subcommittee on Science, Research and Technology
2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Representative Walgren,

I am very much in support of strengthening the Organic Act of the National Bureau of Standards. I am sure that you can appreciate the irreplaceable value that the National Bureau of Standards is to the states weights and measures programs.

Without the support of the "Bureau" the states will go their seperate ways and uniformity in measurements will no longer exist.

Sincerely,

Gaylon M. Kennedy

Gaylon M. Kennedy,
Deputy State Sealer
Bureau of Weights and Measures

GMK:jt
cc: Clayton F. Davis
Edward Stadolnik

STATE OF CONNECTICUT

DEPARTMENT OF CONSUMER PROTECTION

STATE OFFICE BUILDING • HARTFORD, CONNECTICUT 06115

JUN 22 1981

June 19, 1981

The Honorable Douglas Walgren, Chairman
House Subcommittee on Science, Research
and Technology
2321 Rayburn House Office Building
Washington, D. C., 20515

Dear Congressman:

It is my understanding that your Subcommittee is currently conducting hearings relative to the Organic Act of the National Bureau of Standards, which delegates to the Bureau responsibility for "cooperation with the states in securing uniformity of weights and measures laws and methods of inspection." Accordingly, I submit for the Committee's consideration, the following brief statements based upon my thirty-five years experience as a Weights and Measures Official of the State of Connecticut.

Cooperation with the states on matters pertaining to Weights and Measures Standards and Supervision is handled for the Bureau through its Office of Weights and Measures. One of the most important of these tasks is Bureau sponsorship of the National Conference on Weights and Measures, which, since 1905, has worked toward uniformity in the development of model laws and regulations, technical codes for commercial weighing and measuring devices, test methods, enforcement procedures and administrative guidelines for the nation's Weights and Measures Officials. The National Conference on Weights and Measures has been cited on many occasions as an example of how State-Federal cooperation can best be achieved. Its programs have resulted in reducing costs of manufacturing, and/or distributing goods and services for the citizens of this nation, thereby bringing about improvements in our standard of living. These benefits to our citizens and our nation's economy, resulting from improved and more efficient measurement systems and procedures, will continue and increase only if the Office of Weights and Measures is provided with funds necessary to carry on its important and essential work.

An extremely small part of the Bureau's budget is used in carrying out duties assigned to its Office of Weights and Measures, It is the view of many of us involved in Weights and measures supervision, that the portion of this budget allocated to the Office of Weights and Measures has diminished in recent years to a point where it is no longer adequate.

Sincerely,

John T. Bennett, Chief
Weights and Measures Division

JTB/mc
cc: Ann Heffernan
NCWM Conference Coordinator
National Bureau of Standards
P. O. Box 3137
Gaithersburg, Maryland, 20760

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Phone (217) 782-3817

Division of Agricultural Industry Regulation

JUN 22 1981

June 19, 1981

The Honorable Doug Walgren
Chairman
House Subcommittee on Science,
Research and Technology
2321 Rayburn House Office Bldg.
Washington, DC 20515

Dear Representative Walgren,

It has been brought to my attention that your House Subcommittee on Science, Research and Technology is presently conducting hearings concerning the Organic Act of the National Bureau of Standards.

The Office of Weights and Measures at the National Bureau of Standards has provided the Illinois Department of Agriculture's Weights and Measures Program with a high degree of technical, educational and administrative support. The Office of Weights and Measures provides a vital role in the various weights and measures programs throughout the country.

I would recommend to your committee that the Organic Act would include mandating the National Bureau of Standards sponsorship of the National Conference on Weights and Measures, and further to provide increasing support of the State's Weights and Measures Program.

Sincerely,

Sidney A. Colbrook

Sidney A. Colbrook
Weights & Measures Program Manager

SAC:jt

cc: Ed Stadolnik

Agriculture Department
State of Missouri

Christopher S. Bond
Governor

James B. Boillot
Director

June 19, 1981

Honorable Doug Walgren
Chairman
House Subcommittee on Science, Research & Technology
2321 Rayburn House Office Building
Washington, D.C. 20515

Honorable Doug Walgren:

The following remarks are directed to testimony presented at the recent House Subcommittee's hearing concerning the "Organic Act".

We, along with many other jurisdictions, are concerned with the erosion of staff in the National Office of Weights and Measures.

It has been said people in government tend to lose touch, not only with people they serve, but also with the people involved in similar programs in other jurisdictions.

In the field of weights and measures, the National Office has been an excellent connecting link between these jurisdictions, as well as providing training and expertise in all areas of measurement. It is obvious that this excellent service cannot continue if there is a future reduction in personnel.

We also feel that although there is a present trend of decentralization at most federal levels, this type of action would not be in the best interest of the Weights and Measures program. There are distinct advantages in having a central office located in the National Capitol.

Some of these advantages are:

1. Accessibility to pertinent information from other agencies.

2. Prestige and better public acceptance.

DIVISION OF WEIGHTS & MEASURES
(314) 751-4278 P.O. Box 630 - 2830 Industrial Drive, Jefferson City, Mo. 65102

3. Centralization of information pertaining to measurement.

4. A decrease in bureaucracy inconsistency.

The above remarks are a brief synopsis of our views concerning the current conditions in the National Office of Weights and Measures.

We, as a state jurisdiction, recommend and encourage additional support from the legislative branch to the National Bureau of Standards.

Sincerely,

J. W. Abbott, Director
Division of Weights & Measures

JWA/lc

cc: James B. Boillot, Director, Department of Agriculture
Edward H. Stadolnik, Assistant Director of Standards & Chairman, National Conference on Weights & Measures

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS,JR.
CHAIRMAN,BOARD OF AGRICULTURE
YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

June 19, 1981

The Honorable Doug Walgren, Chairman
House Subcommittee on Science, Research and Technology
2321 Rayburn House Office Building
Washington, D. C. 20515

Dear Chairman Walgren:

The National Bureau of Standards is in many respects much like the United States Postal Service--"Too little and too late."

We were apprised, after you had concluded your hearings, that they would be conducted so we submit the following, trusting that it will become a part of the records of those hearings.

First, let me suggest that the National Bureau of Standards is essentially an asset of the American people; properly resourced, it should, as a beacon, chart a course through a meaningless morass of protracted bureaucratic debate, both national and international; conversely, improperly resourced, it is an illusion of dangerous conceptual proportions.

Its very name conjures visions of measurement standards flowing from a national measurement system, which must be, next to godly, absolute perfection. And, therein, lies the danger.

National Bureau of Standards legal counsel, in a speech before the National Conference on Weights and Measures, stated:

> "There are no specific congressional requirements imposing uniformity among the states in the matter of standards.
>
> "Congress...has not seen fit to exercise, to any substantial degree, its authority under the Constitution to establish weights and measures." 1/

In the legislative history, U. S. Code, 1972 Congressional and Administrative News, we read "The overall goal of the National Bureau of Standards, a primary operating unit within the Department of Commerce, is to strengthen and advance the nation's science and technology, and facilitate their effective application for public benefit.
To this end...the Bureau provides:

(1) A basis for the nation's physical measurement system,... .
(2) Scientific and technological services for industry and government, and
(3) A technical basis for equity in trade... ."

The U. S. Code, 1972 Congressional and Administrative News continues:

> "The increasing complexity of modern measurement techniques combined with the increasing cost of facilities required to calibrate and standardize measurement instruments, which are a vital part of international, commercial, technological, scientific, and defense activities, has created a growing need for the National Bureau of Standards, under direction from the Department of Commerce, to provide calibration, measurement, and other specialized services to certain international organizations and to friendly foreign countries. Moreover, the position of the United States, as a leader in the international community of science and technology, requires it to take an active part in encouraging international standardization."

Mr. Chairman, we have, de facto, a dichotomy in the apparent expressed mission of the National Bureau of Standards or, worse, we have a misunderstanding of the rationale behind its legal being. In either case, this should be rectified by addressing the language of the Bureau's Organic Act, to clearly and succinctly enunciate the requisite, mandatory aspects of the Bureau's activities as opposed to those which may be selective.

Certainly, the requirements for active participation in adoption of SI, and the calibration and standardization of measuring systems and measuring equipment abroad, can be no more compelling a need than those same requisite needs, unanswered, at home.

The U. S. Code, 1972 Congressional and Administrative News, continues:

> "For many years, the National Bureau of Standards

> has cooperated with the National Standards Laboratories of other nations, both directly and in cooperation with the Department of State, and indirectly through their International Bureau of Weights and Measures. ...these exchanges of scientific information and special measurement services have been encouraged as an essential part of the responsibilities of the National Bureau of Standards and the Department [Commerce] for the correlation of our national measurement system with those of other nations, and for the precise determination of important physical constants."

In testimony before the subcommittee of the Committee on Appropriations, House of Representatives, Ninety-fourth Congress (first session) 1976, the budget request for the National Bureau of Standards, Office of Weights and Measures, is shown as:

"Activity: Provide services to improve the application of technology.

"Subactivity: State Weights and Measures reflected twenty-four permanent positions authorized for this relatively important agency."

Today, its authorized complement is 11.

The goals and objectives enunciated before Congress were as noble as they were unachievable; e.g.

> "Goals To provide the leadership and technical resources to weights and measures officials, manufacturers, packagers, and consumers that will assure accuracy in commercial quantity determinations: maintain an effective system of fairness and protection for buyer and seller in all commercial transactions involving determination of quantity: promote development and application of new and improved technology in weights and measures: and remove impediments to the free flow of commerce.
>
> "Objectives. To provide and maintain traceability from national standards to commercial measurements and advance professional excellence of those working in the field of weights and measures through training: to provide the secretariat for a national forum for the dicussion and resolution of issues pertaining to and consensus decision making on weights and measures problems, programs and priorities: to investigate new measurement tech-

niques, develop design and performance criteria, test methods and procedures, and foster development or improvement of measurement instruments and devices; to fulfill the legal responsibilities assigned to the Department of Commerce under the Fair Packaging and Labeling Act by assisting consumers to make value comparison of package products, and by assisting state authorities in the development and implementation of model legislation; to provide guidelines for metric conversion on the broad weights and measures regulatory system and to represent and promote United States weighing and measuring practices and philosophy to international standardizing bodies."

Under the caption, "base program," that testimony continues:

"...as mandated in the bureau's organic act...provides leadership and technical resources to state and local weights and measures officials, thus channeling NBS broad measurement capabilities in such divergent areas as physics, statistics, engineering, mechanics, and instrumentation into the commercial marketplace and translating these capabilities into understandable and problem-oriented responses. Specifically, NBS develops weights and measures technology, facilitates its application in commercial transactions, and promotes national voluntary weights and measures standards by working with consumers, manufacturers, packagers, distributors, and state and local regulatory officials. These officials enforce laws and regulations governing packaged goods and measuring devices (such as scales, gasoline pumps, taximeters and fuel oil meters), which together control the annual exchange of at least $900 billion in commercial transactions. There are more than 775 weights and measures jurisdictions in the United States. NBS is the only focal point for working towards equity and uniformity in weights and measures laws, regulations, and inspection methods, among these jurisdictions... ."

Assuming 24 souls could and did accomplish those claimed achievements, we are compelled, Mr. Chairman, to look at their rewards--Where are they now?

Five short years after management was telling you, the United States Congress, how great and significant was their contribution to the commerce of the nation and, indeed, internationally, they were reduced in number to 11. That's about the same level as the 1959-61 budgets reflect.

The issue is one of management priorities.

The Bureau's organic act is a loosely structured document, which merely "authorizes" the Secretary of Commerce to undertake listed functions.

Under Sec. 2(4), the permissive language of the organic act resulted in:

(1) the deterioration of and ultimate transfer to the United States Department of Agriculture of the railroad track scale program, and

(2) the deterioration (and grain scandal) involving grain elevators and grain weighing, and ultimate transfer to USDA via creation of the 1700-person Federal Grain Inspection Service.

While each of the above functions were of critical impact to the commerce of this nation, NBS simply chose to put such a low priority on these programs that Congress finally had to surgically remove them from the Bureau.

Mr. Chairman, do you believe that 11 individuals can direct a non-existent uniform national measurement system from the tiny Office of Weights and Measures, ensconced in some remote location of the National Bureau of Standards?

May we suggest that you contact the Director of Standard Weights and Measures in Pennsylvania, Mr. Fred Thomas, Harrisburg, and determine first hand how much interest and assistance NBS management actually exhibits over national weights and measures problems.

The Organic Act should be amended to mandate the Secretary to perform:

"Sec. 2 The Secretary of Commerce...shall undertake the following functions:
(a) The custody, maintenance, and development of the national standards of measurement, a national measurement system and the provisions of means and methods for making measurements consistent with those standards, including the comparison of standards used in scientific, investigation, engineering, manufacturing, commerce, and educational institutions, with the standards adopted or recognized by the Government.
(5) Cooperation with the states in securing uniformity in weights and measures laws and methods of inspection[;] through their annual

funding and sponsorship of the National Conference on Weights and Measures, Incorporated."

The National Conference on Weights and Measures should continue, structured much as it is, and to operate as a quasi-standards setting body, probably as a non-profit corporation of the District of Columbia (not too dissimilar from the Smithsonian Science Information Exchange, Inc.)

Your consideration is appreciated and future generations will applaud your efforts.

Respectfully,

George E. Mattimoe
State Deputy Director of
Measurement Standards

1/ Allen Farrar's presentation, on NBS authority, to the National Conference on Weights and Measures, San Diego, California, July 1975.

cc: The Honorable Daniel K. Inouye, United States Senator from Hawaii
The Honorable Spark M. Matsunaga, United States Senator from Hawaii
The Honorable Cecil Heftel, United States Congressman from Hawaii
The Honorable Daniel K. Akaka, United States Congressman from Hawaii
Mr. Edward H. Stadolnik, Chairman, NCWM
Mr. Harold F. Wollin, Executive Secretary, NCWM
Mr. Albert D. Tholen, Chief, Office of Weights and Measures, NBS

June 20, 1981

The Honorable Douglas Waldron
Chairman, House Sub-committee on Science, Research and Technology
United States House of Representatives
Washington, D.C.

Subject: Hearings on the National Bureau of Standards Organic Act, as Ammended

Dear Mr. Chairman:

My name is Charles Gerald Bockus; I am employed by the State of Hawaii as a Weights and Measures inspection officer.
As such, I am probably typical of my fellow inspectors throughout the Nation who are charged with the day-to-day implementation and actual enforcement of the myriad of measurement standards that are theoretically created to assure what some people like to refer to as "Equity in the Marketplace."

Personally, I think this term leaves much to be desired insofar as a choice of words is concerned as it usually conjurs up a mental image of a weights & measures type attempting to keep the butcher's thumb off the scale.

Let me just say, therefore that we perform a multitude of tasks, inspectional and otherwise, which hopefully count toward the goal of assuring both buyers and sellers of products susceptible to measurement that they are operating within a system that affords a high degree of measurement accuracy.

In order to competently accomplish this task, we must depend in no small part on the Bureau's providing measurement standards that Congress mandated in the Organic Act, PL 64, Stat. 370 as ammended.

Accordingly, it is my understanding that the National Bureau of Standards conducts "research and provides....a basis for the Nation's physical measurement system....(and)....a technical basis for equity in trade."

That implies to me, Mr. Chairman, that the measurement standards set by the Bureau would be such that the constant and correct use of same would tend to provide all U.S. citizens with a uniform and technically correct system of measure.....much akin to the concept of providing equal protection under the law.

If this understanding is correct, then I am afraid that I am the bearer of some rather unpleasant news concerning a significant area of measurement within which the Bureau appears to have abdicated its responsibilities!

83-040 O—81——16

Before going further, please let me note that I am cognizant of some of the most recently published criticisms of the Bureau by the National Science Foundation Committee on NBS Review to say nothing of the Bureau's inaction in providing the continuation of a national type approval (for new measuring devices) program,
the Bureau's Railroad Scale Test Car "bailout," and its "playing dead" on the creation by Congress of the Federal Grain Inspection Service.

No doubt, others will have found the courage to have formally commented on the Bureau's bumbling on these matters.

There is, however, another Bureau/standards setting related matter to which I would like to draw your attention.
It quite clearly demonstrates the ineptitude and shortcomings of the Bureau as it is NOW organized, staffed and mandated.

This matter has to do with what might easily be described as a nationwide measurement scandal vis-a-vis, in general, the mis-measurement of liquid petroleum, and, in particular, the nationwide, overall "short-delivery" of gasoline and other motorfuels to the U.S. motoring public!

This short-delivery at the "gas pump" amounts, on the average, to hundreds of millions of gallons of motorfuel, ANNUALLY!

Ironically, this ongoing FRAUD is made possible by the very same National Bureau of Standards that created, at public expense, the MEASUREMENT STANDARD for liquid petroleum that, when it is used, enables motorists to receive (and the dealers to deliver) the correct and exact amount of gasoline paid for.

To explain, let me now add a brief, historical, non-technical note:
The National Bureau of Standards, as early as 1918, created, at the behest of the Oil Industry, I am told, what were to be known as the "National Standard Petroleum Oil Tables."
These tables are based on the definition (of measure) of a U.S. petroleum gallon.
Said petroleum gallon being: "That amount of petroleum product which will occupy exactly 231 cubic inches when its temperature is 60 degrees F., or the expanded or contracted equivalent thereto at any other temperature...."

Indeed, Congress was quite rightly aware of this definition of measure which is required for the correct measuring of liquid petroleum as it included essentially the SAME definition of a petroleum gallon in its 1972 Federal Packaging and Labeling Act.

Similarly, U.S. Customs and the Dept. of Defense specify that liquid petroleum measurements be made in terms of a U.S. petroleum gallon via employment of Petroleum (Standard) Measurement Tables.

It was, in great part, in response to the Federal Packaging and Labeling law as well as other fuel measuring specifications, that a question was raised to the Bureau relating to the equitable measuring of liquid petroleum products at the "gas pump."

To wit: " If packages or containers of Blazo, kerosene or motor oil, as well as imports of petroleum and those amounts of petroleum purchased by the Federal Government must be measured in terms of a U.S. petroleum gallon, then must not common sense dictate that similar petroleum products metered via a gas pump, or truck meter, or rack meter, be measured SIMILARLY?"

The correct answer to this question is: OF COURSE, if one wants the product to be fairly, uniformly and equitably measured on a consistant basis!

And isn't consistant, equitable measurement largely what the Bureau was mandated to create?

Well Mr. Chairman, you surely wouldn't know it by examining the Bureau's evasions to the question as posed above!

After wading through five years of Bureau buck passing, it took the efforts of a U.S. Senator to break loose from the Bureau, an admission in writing of what we already knew of the definition of measure of a U.S. petroleum gallon. (see attached)
At that, it was a grudging and incomplete admission.

Mr. Chairman, it now seems appropriate to note that what the Bureau seems to have conveniently overlooked in its "actions" to provide a "technical basis for equity in trade," is that it is mandated by Congress to provide the benefits of its research for any and ALL U.S. Citizens.

Not just the Oil Industry.

For example, perhaps the Director of Weights and Measures (Fred Thomas) in your own state of Pennsylvania might never have had to suffer the indignity of being named as a party in a court action claiming short-delivery of motorfuel by a Mr. Elliott Goldstein HAD the Bureau correctly and honestly advised Pennsylvania (as well as all other U.S. weights and measures juris--dictions) of the correct definition of measure of a U.S. petroleum gallon!

Currently, there is an immediate need for the Bureau to do JUST THAT for the states of New Jersey, Utah, Colorado and Michigan.

Seems, per my lights, that there exist, in these states, certain interests which, without much qualm nor inquery to the Bureau, would prostitute the methods of correct petroleum measure.

In this regard, Mr. Chairman, your hearing is most timely and it might certainly do well for Congress to now remind the States that Congress has the power, not only to coin money, but to "fix the Standard of Weights and Measures;....." as well.

In other words, we have come, really, to a basic constitutional issue, i.e. is our Nation going to have a single, all inclusive, uniform MEASUREMENT SYSTEM or is it going to have fifty-plus different and perhaps discriminatory systems?

Insofar as establishing a Nationwide, uniform system of petroleum measurement the Bureau has been ineffective.
Certainly, the language of the Organic act could be revised so as to require the Bureau to act POSITIVELY on just such matters,
or,
all state and local weights and measures jurisdictions could be "Federalized" (including the Federal Grain Inspection Service) so that clear cut uniformity of measure could be instituted,
or,
stricter Senate control over the nominee for Bureau Director could be requested,
or,
all of the above.

Whatever the choice, the time has come for "a true system of weights and measures" to come to birth in this Nation.....that is unless you want to see a furtherance of white collar crime within the so called petroleum measurement industry.

Ralph Ford Fortune

attachment

cc: U.S. Representative Heftel
U.S. Senator Matsunaga
U.S. Senator Inouye

ENCLOSURE 1

SPARK M. MATSUNAGA
HAWAII

WASHINGTON OFFICE:
382 RUSSELL BUILDING
WASHINGTON, D.C. 20510

HONOLULU OFFICE:
3104 PRINCE KUHIO BUILDING
HONOLULU, HAWAII 96850

United States Senate

WASHINGTON, D.C. 20510

February 4, 1980

CHIEF DEPUTY
MAJORITY WHIP

CHAIRMAN, SUBCOMMITTEE ON
TOURISM AND SUGAR
COMMITTEE ON FINANCE

MEMBER:
COMMITTEE ON ENERGY AND
NATURAL RESOURCES
COMMITTEE ON
VETERANS' AFFAIRS

Mr. Charles G. Bockus
P.O. Box 226
Captain Cook, Hawaii 96704

Dear Charlie:

Thank you for your letter dated December 17, 1979, responding to my letter of December 11 and informing me that all the National Bureau of Standards is being asked to do is to honestly answer your question as to the correctness of the definition of a U.S. petroleum gallon. I regret the delay in my response.

According to Mr. Albert D. Tholen, Chief, Office of Weights and Measures, the Model State Packaging and Labeling Regulation, section 7.3(b), actually sections 6.5(b) and 7.4(b), state that the quantity, in units of liquid measure, of a United States gallon of a petroleum product, is 231 cubic inches. This measurement expresses the volume at 60°F.

I appreciate your contacting me regarding this matter. I hope to hear from you again should you require any additional information or assistance.

Aloha and best wishes.

Sincerely,

Sparky

Spark Matsunaga
U.S. Senator

JUN 29 1981

KANSAS STATE BOARD OF AGRICULTURE

DIVISION OF WEIGHTS AND MEASURES
JOHN L. O'NEILL, State Sealer
Director, ANHYDROUS AMMONIA SAFETY
901 Kansas Ave.
Topeka, Ks. 66612
(913) 296-3846

W. W. DUITSMAN
Secretary

June 22, 1981

Representative Doug Walgren
Chairman
House Subcommittee on Science
Research and Technology
2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Representative Walgren:

In behalf of the State Weights and Measures Program in Kansas and the two city jurisdictions, Kansas City, Kansas and Topeka, we strongly support the Organic Act of The National Bureau of Standards, as we have to depend on the National Bureau of Standards for traceability to our State Standards Laboratory for training of our field people in Weights and Measures Training and the National Weights and Measures Conference for support in which we adopt as regulations by reference to our State and City Laws in this area.

We hope the committee acts favorable as this area depends so much for leadership in Weights and Measures in all aspects from the National Bureau of Standards.

Very truly yours,

John L. O'Neill
State Sealer

JLO:jc
cc: Donald Lynch, Kansas City, Kansas
Donald Weick, Topeka, Kansas
Edward H. Stadolnik, Chairman National Conference
Harold F. Wollin, Executive Secretary, National Conference

JUN 25 1981

STATE OF COLORADO

DEPARTMENT OF AGRICULTURE
1525 Sherman Street
Denver, Colorado 80203
(303) 839-2811

Weights & Measures Section
3125 Wyandot, Denver, CO 80211
Phone (303) 866-2845

Richard D. Lamm, Governor
Morgan Smith, Commissioner
Donald Svedman, Deputy Commissioner

Agricultural Commission
Henry Christensen, Roggen
Ben Eastman, Hotchkiss
John Malloy, Denver
Elton Miller, Fort Lupton
Don Moschetti, Center
William Stephens, Gypsum
William Webster, Greeley
Clede Widener, Granada
Kenneth Wilmore, Denver

June 22, 1981

Representative Doug Walgren
Chairman
House Subcommittee on Science,
Research and Technology
2321 Rayburn House Office Building
Washington, D.C. 20515

Subject: Organic Act of the National Bureau of Standards

Representative Walgren:

I would like to recommend to your Committee that the Organic Act be strengthened to mandate the National Bureau of Standards sponorship of the National Conference on Weights and Measures to assist the States in the administration of weights and measures, including technical, educational, and administrative resource capabilities.

The functions of Weights and Measures Officials are of utmost importance in our modern market place.

Our greatest challenge is to update our technology and to foster uniformity in enforcement amoung the States.

The Office of Weights and Measures/NBS has been of utmost importance in assisting in the achievement of these matters.

I urge your committee to act favorable upon my request, so that work can continue as it has in the past. To do otherwise would greatly effect the future progress of the weights and measures functions throughout the Nation.

Very truly yours,

Leo Letey

Leo Letey, Chief
Weights and Measures Section
Colorado Department of Agriculture

LL/dot

The National Association of State Departments of Agriculture

1616 H Street, N.W. • Washington, D.C. 20006 • (202) 628-1566
James B. Grant, *Executive Secretary*
Stuart B. Hardy, *Assistant Executive Secretary*
D.M. Burkhead, *Administrative Assistant*

JUN 26 1981

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Northeastern Region

June 23, 1981

Hon. Doug Walgren, Chairman
Subcommittee on Science, Research
and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Walgren:

I understand that the Subcommittee on Science, Research and Technology has recently conducted oversight hearings on the operation of the National Bureau of Standards, and I would like to take this opportunity to express our full support for the Bureau's Office of Weights and Measures. This office has provided invaluable technical assistance to State and local weights and measures agencies -- many of which are lodged in State Departments of Agriculture. The office also sponsors the annual Conference on Weights and Measures which promotes uniformity among the States and helps assure that State and local testing methods are current with state of the art technology.

Enclosed, for your consideration, is a copy of a recent NASDA resolution (ETWM-4) entitled, "Assistance from the National Bureau of Standards."

Our Association appreciates the support that you and the Subcommittee have given to the Bureau and its Office of Weights and Measures, and we

look forward to assisting you in any way we can in your efforts to maintain a strong and effective program.

Yours very truly,

James B. Grant
Executive Secretary

JBG:lba

Enc.

cc: Hon. Frederic Winthrop, Jr., President
Hon. Richard E. Rominger, Chairman
Energy, Transportation, Weights and Measures Committee
Mr. Edward H. Stadolnik

ENCLOSURE 1

NATIONAL ASSOCIATION OF STATE DEPARTMENTS OF AGRICULTURE
1616 H Street, N.W., Washington, DC 20006

1979

Policy No. ETWM-4

ASSISTANCE FROM THE NATIONAL BUREAU OF STANDARDS

The National Conference on Weights and Measures was organized in 1904 "to bring about uniformity to Weights and Measures and also to affect a close cooperation between the state Weights and Measures inspection services and the National Bureau of Standards." From the inception, the National Bureau of Standards has sponsored a National Conference as a means of promoting uniformity in Weights and Measures laws, regulations, and methods of testing equipment that comprises legal metrology. This sponsorship is authorized under a portion of the Organic Federal Act which suggests "cooperation with the states in securing uniformity of weights and measures laws, and methods of inspection within limitation of available funds." Over the years, the Bureau and particularly the Office of Weights and Measures has supplied technical information and guidance to all state and local Weights and Measures programs. When what appears to be an encroachment of state rights through federal preemption such as the Fair Packaging and Labeling Act, the USDA Net Weight issue, and the Federal Grain Inspection Service rules on grain scales, it behooves the Bureau to take an increasing voice as liaison between the Federal and State agencies in order that all regulatory officials may be uniform in requirements and interpretation. Also with the U.S. involvement in the Inter-

national Organization of Legal Metrology, this further exemplified the need for the National Bureau of Standards, Office of Weights and Measures close cooperation and support.

RESOLVED, that the National Association of State Departments of Agriculture, meeting at Winston-Salem, North Carolina, on September 26, 1979, requests that the U.S. Department of Commerce place a high priority on weights and measures programs and continue its supportive role on training, liaison between federal and state agencies, development of model laws, regulations and other technical requirements, moisture meter standards, national type approval for devices, laboratory audit programs to insure traceability to NBS and other research and development programs.

State of Wisconsin
DEPARTMENT OF AGRICULTURE, TRADE & CONSUMER PROTECTION

Gary E. Rohde
Secretary

801 WEST BADGER ROAD
P.O. Box 8911
MADISON, WISCONSIN 53708
608 266-1721

JUL 30

June 26, 1981

Representative Doug Walgren
Chairman
House Subcommittee on Science,
Research and Technology
2321 Rayburn House Office Bldg.
Washington, DC 20515

Dear Representative Walgren:

The Trade Division of our department enforces the weights and measures standards in the State of Wisconsin. These standards are based on the national standards published by the National Bureau of Standards.

Since your committee is holding hearings relative to the National Bureau of Standards Organic Act, we would recommend that the Organic Act be strengthened to mandate the National Bureau of Standards sponsorship of the National Conference on Weights and Measures to provide a greater assurance in the role of the Office of Weights and Measures to assist the states in the administration of weights and measures including technical, educational and administrative resource capabilities.

It is through the action of the National Conference on Weights and Measures that the rules and standards are promulgated. These standards became the law in many states such as Wisconsin. The continuation of this conference is also important to help ensure uniformity in weights and measures across the nation. Such uniformity assists both regulated businesses and enforcement agencies alike.

The National Bureau of Standards, Office of Weights and Measures, is the only federal agency which provides basic measurement standards and inspection standards for use by the many state, county and city weights and measures jurisdictions.

One active federal agency is needed to provide the basic standards and inspectional standards in an ever increasing technological commerce. Local and state weights and measures jurisdictions do not have the budget or staff to develop technical training programs for their staff, and if a local jurisdiction did develop a training program, they could not afford to provide training to other states or jurisdiction.

Therefore, we urge your committee to act in support of a strong viable N.B.S. office of weights and measures which can continue to improve on an already effective federal, state and local jurisdiction system of weights and measures.

Sincerely,

Gary E. Rohde

Gary E. Rohde
Secretary

GER/p/T3/13/D7

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

EDWARD H. STADOLNIK
CHAIRMAN
COMMONWEALTH OF MASSACHUSETTS
ONE ASHBURTON PLACE
BOSTON, MASSACHUSETTS 02108
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HAROLD F. WOLLIN
EXECUTIVE SECRETARY
NATIONAL BUREAU OF STANDARDS
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GAITHERSBURG, MARYLAND 20760
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June 29, 1981

Representative Doug Walgren
Chairman
House Subcommittee on Science, Research and Technology
2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Representative Walgren:

This is in regard to recent hearings conducted by your Subcommittee on Science, Research and Technology concerning the Organic Act of the National Bureau of Standards.

I currently hold the position of Assistant Director of Standards for the Division of Standards, for the Commonwealth of Massachusetts. I have been associated with the Division of Standards for the past 22 years, which is a good part of my 40 years of State Service. The Division of Standards is the state regulatory body relating to the enforcement of laws and regulations concerning weights and measures. I also serve as the Chairman of the National Conference on Weights and Measures.

I believe I can state with certainty, that throughout this country, our state, county and municipal weights and measures officials are concerned with the erosion of staffing at the Office of Weights and Measures at the National Bureau of Standards. The Office of Weights and Measures at the National Bureau of Standards is the unifying foundation upon which the nation's trade, commerce and everyday purchases of vital consumer goods and services are built. We, in the weights and measures community, believe that there could well be an adverse economic impact throughout this nation unless the resources at the Office of Weights and Measures are strengthened, and one of the means of assuring such a strengthening would be providing more of a mandate in the Organic Act with regard to the important role of the Office of Weights and Measures.

The states need the assurance of the continuity of the National Conference on Weights and Measures, which is sponsored through the Office of Weights and Measures of the National Bureau of Standards. This Conference has had a long, productive and effective history of providing the necessary uniformity to the nation's conduct of trade and commerce. The National Conference on Weights and Measures brings together at its meetings approximately 500 persons comprising state, county and municipal regulatory officers, other officials of

federal, state and local governments, representatives of manufacturers, industry, business and consumer organizations. The National Conference on Weights and Measures develops many technical, legal and general recommendations in the field of weights and measures administration and technology and its programs explore the entire area of this economically important segment of governmental measurement services. It provides the necessary regulatory uniformity between the 50 states, and without this uniformity there could very well develop a situation where 50 different sets of regulations relating to weights and measures could evolve.

In addition to the need for the continuity of the National Conference on Weights and Measures, the states also recognize the need for the assistance and guidance from the Office of Weights and Measures at the National Bureau of Standards in a number of other equally important functions.

1) The assurance of accuracy of measurement standards at State Measurement Laboratories by providing comparison with the National Standards at the National Bureau of Standards when necessary; providing uniform training to state metrology personnel; continuity of the laboratory assurance programs and providing other vital information to state measurement laboratories. These state metrology laboratories serve a wide variety of clients within their states including state, county, municipal and industry groups who need measurement analysis of their standard measuring instruments.

2) Coordinating the development of national training programs for state, county and municipal weights and measures officials who are faced with an ever expanding technology in the development of weighing and measuring devices that are utilizing design of increasing complexity.

3) Continuity of the prototype testing program for weighing and measuring devices that provide valuable information to the states and perform a service to industry.

4) The development of field and laboratory standards for the testing of weighing and measuring devices. This is particularly applicable to new device design and also to review the need for development of other types of field standards such as units for testing of vehicle truck scales.

June 29, 1981

As noted previously, we believe that these concerns may be met by strengthening the role of the Office of Weights and Measures through an appropriate modification of the Organic Act.

Very truly yours,

Edward H. Stadolnik

Edward H. Stadolnik
Assistant Director of Standards

and

Chairman
National Conference on Weights and Measures

js

Department of Agriculture
AGRICULTURE BUILDING CAPITOL SQUARE
ATLANTA, GEORGIA 30334

Thomas T. Irvin
Commissioner

JUL 8 '81

July 1, 1981

Representative Doug Walgren
Chairman
House Subcommittee on Science,
Research, and Technology
2321 Rayburn House Office Building
Washington, D. C. 20515

Dear Representative Walgren:

The States' Weights and Measures have had a working arrangement with the National Bureau of Standards' Office of Weights and Measures for many years.

The National Bureau of Standards sponsors the National Conference on Weights and Measures to promote uniformity among the states. This sponsoring is exercised under the authority of that portion of the Organic Federal Act where the bureau is authorized to undertake cooperation with the states in securing uniformity in Weights and Measures laws and methods of inspection.

The Office of Weights and Measures has rendered technical assistance to the states in every area of their responsibilities which have included administration, training, sound Weights and Measures laboratory procedures, and in particular, any area involving responsibilities which include assistance and recommendations on the moisture meter program.

The Office of Weights and Measures in the National Bureau of Standards possesss the highest degree of expertise; and without their assistance, the consumer would not have the advantage which is enjoyed today and industries would be in a disarray, confusing the manufacturer in the marketing of weighing and measuring equipment.

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83-040 O—81——17

A reduction in staffing has already had noticeable impact on the activities of the states. One important area is the prototyping of measuring devices which assures the consumer of equipment that has been properly designed and will meet exacting specifications which have been prescribed and approved by the National Conference.

It is expedient that the detrimental effects be recognized and that proper attention be directed to budgeting and staffing in the Office of Weights and Measures.

I appreciate the opportunity to express my views and certainly hope that adequate recognition be given to the needs as they exist.

Sincerely,

O. D. Mullinax

O. D. Mullinax
Assistant Commissioner
Fuel and Measures

ODM:cc

MISSISSIPPI
DEPARTMENT
of
AGRICULTURE
and
COMMERCE
P. O. Box 1609
Jackson, Mississippi 39205

JIM BUCK ROSS
COMMISSIONER

JUL 10 1981

July 7, 1981

The Honorable Douglas Walgren, Chairman
Subcommittee on Science, Technology, and Research
United States House of Representatives
Suite 2321, Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman Walgren:

In these days when a cost-to-benefit consideration occupies the principal place in the minds of every responsible State and Federal servant and thankfully this is exactly as it should be.

I would most respectfully ask your subcommittee to consider that very special, perhaps unique, place held by the National Bureau of Standards in its opportunity to offer genuine service, really not available in any other configuration, to improve the measurement capabilities of this nation.

Your committee will have developed the past history of the National Bureau of Standards. The purpose of this letter is to ask that you maintain its mission as it relates to measurement service and that you consider the need/value/cost of enhancing its capabilities for that mission.

It would be difficult to imagine any other Federal entity that can so beneficially affect the economic well being of the citizens of this nation, provide base source data to industry and assist the States in the better performance of their individual statutory duties. Please help us to help ourselves.

Respectfully,

Mark Freeman

Mark D. Freeman
Executive Assistant, &
Director of Regulatory
Services

MDF/lcm

THIS PAPER IS MADE FROM TREE WOOD AND NEW COTTON FIBER - PRODUCTS OF USA

Wayne A. Cawley, Jr.
Secretary

William M. Linton
Deputy Secretary

STATE OF MARYLAND
DEPARTMENT OF AGRICULTURE
Parole Plaza Office Building
Annapolis, Maryland 21401

July 17, 1981

The Honorable Douglas Walgren, Chairman
Subcommittee on Science, Research and Technology
United States House of Representatives
Suite 2321, Rayburn House Office Building
Washington, D.C. 20515

Dear Representative Walgren:

It has recently come to my attention that the Subcommittee on Science, Research and Technology is reviewing the Organic Act of the National Bureau of Standards. I wish to take this opportunity to express some views which I hope will be of interest and assistance to the Subcommittee.

As Secretary of Agriculture for Maryland, one of my responsibilities is to insure accurate commercial measurement through the enforcement of the State's Weights and Measures Law; a law which is essential for the economic and social well-being of our citizens. As is the case with other States, we have relied heavily upon the National Bureau of Standards to provide those services which result in national uniformity in this endeavor. In the past, this has been an excellent relationship; it is cost effective and efficient, and an outstanding example of Federal-State cooperation. With the expenditure of a relatively small amount of resources, through the budget of the Office of Weights and Measures at the National Bureau of Standards, the Federal government has been largely successful in bringing quantity assurance to this Country's population without the need to maintain a large federal inspection force.

In recent years, however, I have joined others in their growing concern that the National Bureau of Standards is diminishing its emphasis on the services historically provided to the States' weights and measures officials and their programs. I am certain that the directing staff at the National Bureau of Standards have many projects competing for their resources. I am equally certain that those projects appear more impressive than the delivery of measurement services and other related activities which have historically been provided to weights and measures officials. Weights and measures programs have existed for a very long time but it should not be thought that old programs do not have new and increasing needs.

Technology, in the commercial measurement field, has changed dramatically in recent years; probably more changes in devices, systems and methods have taken place in the last two decades than were experienced in the previous fifty years. At this point in time, there is a greater need for uniformity, coordination, training, and measurement support than ever before. The support of the National Bureau of Standards, however, has not increased; in the view of many it has become inadequate and, in fact, has been reduced. The latter is evidenced by a reduction of the staff in the Office of Weights and Measures to less than half of the number which existed ten years ago.

I respectfully suggest that your Subcommittee exercise great care that no changes be made in the Organic Act which might further reduce the ability or the desire of the National Bureau of Standards to carry out its important basic mission. I am confident that State Secretaries and Commissioners of Agriculture, as well as their Weights and Measures Administrators, support a clear mandate for the National Bureau of Standards to continue sponsorship of the National Conference on Weights and Measures. In addition, I believe the National Bureau of Standards should increase its office of Weights and Measures personnel and budget to meet the increasing needs of the state programs. I am advised, for example, that there is a need to expand the existing Laboratory Auditing Program administered by the Office of Weights and Measures; surely this is an important function and will require additional personnel.

I am aware that you have already heard comments from persons who are considered to be highly respected leaders in the commercial measurement field. They represented the state governments, the private sector and the National Conference on Weights and Measures. I urge you to favorably consider their remarks.

Thank you for this opportunity to provide comments to your Subcommittee; it is my sincerest wish that they be of some value to you in your deliberations.

Sincerely,

Wayne A. Cawley, Jr.
Secretary

WAC:dw
CC: Senator Charles Mathias
Mr. J.B. Grant
Mr. R.L. Thompson

HEWLETT PACKARD

1501 Page Mill Road, Palo Alto, California 94304 Telephone 415 857-1501, TWX 910 373 1267

July 31, 1981

AUG 07 1981

The Honorable Doug Walgren, Chairman
House Science, Research and Technology Subcommittee
Washington, D.C. 20515

Reference: Hearings on the NBS Organic Act

Dear Mr. Walgren:

We are pleased that your committee has commissioned the GAO and Library of Congress to study the NBS and is considering amending the NBS Organic Act.

As a leading manufacturer of test and measurement equipment, scientific computers and calculators, we have a considerable interest in the long range strategies and operations of the Bureau of Standards. A number of our Hewlett-Packard people have worked closely with NBS over the years and several have served on review panels serving the various operational centers and labs. Hewlett-Packard and our industry depend critically on the basic standardization functions of the Bureau since those measurement services and measurement R&D underpin the credibility of our industry.

Our concern is that the mandated projects Congress has sent to NBS over the last 5-10 years have consumed significant fractions of their budgets, management and manpower at the expense of the basic standardization function. While dollar budgets have risen somewhat, the O.M.B. personnel ceilings are immovable and the latest announced R.I.F. will cut further into the standardizations functions that are vital to industry.

We've not disagreed with the judgement of Congress in assigning technical projects such as consumer safety or building technology to NBS. Their technical and management are excellent. The results have been impressive.

However, we believe Congress should have accompanied these mandated programs with adjusted budget and personnel ceilings so that standards programs important to our industry would not have been sacrificed. We have seen overall reductions in measurement services, reflecting the Bureau's inability to replace key skilled people who have left or retired from projects in measurement services. We think morale in those areas has suffered as service to industry has been curtailed.

We believe an Organic Act, which clearly recognizes NBS's primary function as the Bureau of Standards is appropriate. It should be a national center for excellence in measurement oriented research and development with an affirmation of the importance of research on fundamental constants, as well as new methods of basic measurement. In closely following the funding and staffing of the National Bureau of Standards over the last decade, we have seen consistent errosion in the resources made available to the standardization function. Ray Sangster's 1976 NBS study of the National Measurement System revealed that measurements in the United States cost about 6% of the Gross National Product. Measurement is a major sector of our society's commercial activity, and the National Bureau of Standards fills a vital role in providing the references and techniques with which those measurements are made.

In reviewing the testimony at your recent hearings, we've observed considerable emphasis upon establishment of the National Bureau of Standards as a national center of excellence in science. Research, to be productive and effective, must generally be done in the broad context of the applicability of the knowledge being sought. We believe that research can be legitimately and effectively executed at the National Bureau of Standards in the quest for knowledge buttressing the national measurement system. The Bureau of Standards has an excellent track record in relating the fundamental physical quantities of length and time to practical standards. As a result, our nation's measurement system is on much firmer underpinnings today, and we are currently able in those narrow areas to make measurements with precisions in the range of parts in ten to the 12th for time and parts in ten to the eigth in length on a practical basis in industry. There are, however, many areas of measurement that are not so firmly buttressed by the results of research, and research in these areas would be most appropriate for the Bureau of Standards to conduct.

In order for the National Bureau of Standards to effectively execute research in these areas, it must have a sustained funding and staffing base that can attract and retain outstanding scientists. The annual monotonic reduction of real capability in the Bureau of Standards has eroded the excellent base in measurements that have been established over a number of years and this must be corrected.

While strong support for research at the Bureau of Standards is clearly in the nation's interest, it is not effective unless it is coupled to a practical delivery system of standardization to the nation's industry.

At the urgings of the Department of Commerce, the National Bureau of Standards has had several activities in the pursuit of industrial technical innovation to buttress such depressed industries as Shoemaking. Such activities which have little relationship to standardization seem to be of little benefit to industry and could be better handled by the private sector or funding to independent research organizations.

On the positive side, it would be most appropriate for the National Bureau of Standards to conduct investigations into measurement methods in support of high technology, such as the Semiconductor industry. Electrical and physical measurements of complex integrated circuits is an exploding area of commerce and an expanding area of scientific measurement and standardization. Requirements for high speed probing of memory and processor chips might be an appropriate area to investigate, for example. Involvement of the National Bureau of Standards in establishing standards for interfacing automation systems and robotics might be an additional area of interest.

In summary, we urge the reaffirmation of the National Bureau of Standard's basic responsibility in research and in delivery of a national measurement system. While Congress may, from time to time, find it appropriate to utilize the scientific and engineering skills at the Bureau of Standards to explore areas other than standardization, we urge that these mandated programs be adequately funded, to avoid eroding the research and delivery capability of the Bureau of Standards in the area of industrial measurement. We urge you to consider not only in the review of the Organic Act, but in annual funding as well that the responsibilities of the Bureau of Standards are long term. To develop and retain appropriate scientific staff requires a clear charter and a sustained funding pattern.

We hope these comments will be helpful to your deliberations concerning the National Bureau of Standard's long range strategic plan and that legislative changes in the Organic Act will provide an even stronger charter for standardization at the National Bureau of Standards.

Sincerely,

HEWLETT-PACKARD COMPANY

Donald L. Hammond

Donald L. Hammond, Director
Center for Physical Research

DLH/lt

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

EDWARD C. HEFFRON
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August 25, 1981

The Honorable Douglas Walgren, Chairman
Subcommittee on Science, Technology, and Research
United States House of Representatives
Suite 2321 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Walgren:

On behalf of the National Conference on Weights and Measures, I am enclosing a copy of a resolution concerning the Organic Act of the National Bureau of Standards (NBS) that was adopted by the Conference during its annual meeting in St. Louis, Missouri on July 16, 1981.

We trust that you will lend your support to our effort to assist NBS in providing the vital leadership and technical assistance that is so badly needed by the States and local jurisdictions, as well as business and industry, to adequately maintain our Nation's weights and measures system.

Sincerely,

Edward C Heffron

Edward C. Heffron
Chairman

cc: Members, House Subcommittee on Science,
Research, and Technology
Malcolm Baldridge, Secretary of Commerce
Ernest Ambler, Director, NBS
Albert Tholen, Chief, Office of Weights
and Measures, NBS

ENCLOSURE 1

RESOLUTION ON THE
REVIEW OF NBS ORGANIC ACT

WHEREAS: The voluntary standards of Laws and Regulations are one of the primary products of the National Conference on Weights and Measures, the long term goal of which is essentially the same as part of the National Bureau of Standards Organic Act which states: "...securing uniformity in weights and measures laws and methods of inspection..." and

WHEREAS: The lack of adequate support by the National Bureau of Standards through the Office of Weights and Measures has made it necessary for the 66th National Conference on Weights and Measures to carry over for consideration several items which must be addressed in a timely fashion; the troubling aspect of this situation is that as each year's agenda is burdened by carryovers from the previous year, the snowballing effect may threaten the effectiveness of the Conference, and

WHEREAS: This indifference and lack of adequate support by the National Bureau of Standards to the Office of Weights and Measures has resulted in a lack of national leadership to the States and degradation of weights and measures programs, therefore

BE IT RESOLVED: That this National Conference on Weights and Measures by resolution to the Subcommittee on Science, Research, and Technology enlist their support in mandating the Director of the National Bureau of Standards to provide technical and professional support to State Directors of Weights and Measures programs; and to continue to sponsor the National Conference on Weights and Measures.

BE IT FURTHER RESOLVED: That this Conference goes on record of supporting the testimony and recommendations which were stated on June 17-18, 1981 before the House Subcommittee on Science, Research, and Technology of Sydney D. Andrews, American Society for Testing and Materials, James R. Bird, National Conference on Weights and Measures, and Kenneth L. Hammer, Scale Manufacturer's Association.

AND BE IT FURTHER RESOLVED: That this Resolution be sent to the Honorable Doug Walgren, Chairman, Subcommittee on Science, Research, and Technology and copies to members of the House Subcommittee on Science, Research, and Technology; Honorable Malcolm Baldridge, Secretary of Commerce; Dr. Ernest Ambler, Director, National Bureau of Standards, and Albert D. Tholen, Chief, Office of Weights and Measures, National Bureau of Standards.

Adopted by the 66th National Conference
on Weights and Measures

July 16, 1981

September 14, 1981

Chairman
Subcommittee on Science, Reasearch and Technology
House of Representatives

SEP 18 1981

Dear Mr. Walgren:

Thank you for your letter acknowledging my input to your hearings on the Organic Act of the National Bureau of Standards.

Thought you might like to be copied on my latest "go-round" with the Secretary of Commerce vis a vis NBS' head-in-the-sand attitude in NOT carrying out its Congressional mandate.

In this case, its failure to provide the Nation's weights & measures jurisdictions with a technically correct STANDARD of MEASURE for all liquid petroleum products.

I have little doubt that I shall receive the usual evasive reply from Commerce/NBS in response to my letter of August 4.

Thanks again,

Charles G. Bockus

atts

ENCLOSURE 1

August 4, 1981

Malcom Baldrige, Secretary
United States Department of Commerce
Washington, D.C. 20230

Dear Mr. Baldrige:

Shades of Herman Hickman! It seems that your "advisors" at NBS and I have a difference of opinion vis a vis the contents of your letter to me dated July 29.

Firstly, re NBS' "alleged failure to provide....." If indeed, NBS has provided State and Local weights and measures jurisdictions with a definition of the STANDARD of measure of liquid petroleum products, I, as a weights and measures official must have somehow missed receiving same.

Therefore, would you be kind enough to provide me with a copy of the definition that was so provided?

Incidentally, for the sake of consistantcy, I would hope that the definition so provided by NBS would jibe exactly and completely with the standard of petroleum measure outlined in attachment # 1 to this letter.

Secondly, not all State and Local weights and measures officials belong to or choose to attend the NCWM, nor can a concensus of NCWM opinion be construed as something necessary in developing a national standard(s) of measure! Such action is a prerogative of Congress as enumerated in the U.S. Constitution and delegated to the Secretary of Commerce.

Naturally, NCWM can and does vote any which way it wants on whether or not to apply equitable methods of measurement to petroleum.
But lets be certain that those voters were provided with a technically correct definition of a standard of petroleum measure BEFORE they voted.

Thirdly, (and this is really the basic issue in the effective functioning of any national measuring system) buyers and sellers of any measureable commodity ARE adversly affected when a STANDARD for equitable measurement is NOT provided.
Mark this well: temperature compensation = equitable petroleum measurement, be that measurement made at the wellhead, refinery, storage facility, pipeline, rack, truck, service station or packaging facility!

Fourthly, contrary to what your NBS director and/or NCWM would have you believe, there is a substantial body of evidence extant which clearly demonstrates the need for a national, uniform system of petroleum measurement.

Just one example of this evidence is the July 8, 1980 Library of Congress Review and Analysis of Temperature Compensated Gasoline at the Retail Pump.

This document shows, in effect, that without a uniform national standard, the Nation's motorists are being "shorted at the gas pump" to the tune of hundreds of millions of dollars, ANNUALLY!

Another, yet related piece of evidence which demonstrates the crying need for the whole hearted inception of a uniform national standardization of petroleum measurement is contained in attachment # 3.
As you can see, state by state fuel measurement chaos is being foisted on dealers and/or the public.

Not so incidentally, this use of varying (petroleum) measures in the states was one of the phenomena that the framers of the U.S. Constitution found repugnant and sought to correct.
This concept of nationwide equity in trade was further reinforced in the Standard Container Act of 1928 and its resultant constitutionality vis a vis the case of U.S. vs Porter, 1938.

Fifthly, of course the cost of converting the Nation to a system of honest and ethical petroleum measurement is going to be borne by the consumer!
But as you can discern by the somewhat out of date, albeit valid figures in attachment #2, when the cost is amortized, the consumers will FINALLY begin getting ALL the product they pay for at the pump!

What sayeth your Dr. Ambler et al, now?

Sincerely,

Charles G. Bockus

atts

bcc: U.S. Representative Doug Walgren, Chairman, Subcommittee on Science, Research and Technology

ENCLOSURE 2

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

29 JUL 1981

Mr. Charles G. Bockus
Route 1, Box 213
Holualoa, Hawaii 96725

Dear Mr. Bockus:

Thank you for your letter concerning the National Bureau of Standards' (NBS) alleged failure to provide State and local weights and measures jurisdictions with a definition of the standard of measure for liquid petroleum products.

The State and local officials at the annual meetings of the National Conference on Weights and Measures (NCWM) are aware of alternative standards of measure and have consistently voted against any change in the method of sale to allow temperature adjustment of bulk petroleum products at retail. The Director of NBS is ex officio President of the NCWM. He agrees with the opinion of the NCWM because there is no evidence that on balance consumers are adversely affected by the absence of temperature compensation in retail sales. The cost of converting the nation's gasoline pumps to be temperature compensated would be considerable and eventually passed on to consumers.

I agree with the position of the NBS Director.

Sincerely,

Secretary of Commerce

September 25, 1981

SEP 29 '81

Chairman
House Subcomittee on Science, Research and Technology
Washington, D.C.

Dear Mr. Walgren:

Well, I was right. Attached is a copy of an NBS letter from Arthur McCoubrey, supposedly in reply to my letter of August 4th to the Secretary of Commerce.

Therein lies the usual NBS dodge and evasion!

It would tend to make one think that NBS really has something AGAINST equitable and honest methods of petroleum measurement.

In any case, NBS is fast causing me to lose any TRUST I may have had in that organization.....a sad state of affairs.....when a field inspector can no longer trust the "standard bearer."

When will NBS be required to carry out its Congressional mandate?

Yours truly,

Charles G. Bockus

atts

ENCLOSURE 1

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

September 3, 1981

Mr. Charles G. Bockus
Route 1, Box 213
Holualoa, Hawaii 96725

Dear Mr. Bockus:

This is in reply to your letter of August 4, 1981, to Secretary Baldrige.

Weights and measures activities in the United States, in the absence of Federal preemptive legislation, has become primarily a function of State and local governments. The role of the National Bureau of Standards, as it relates to the weights and measures area, is set out in section 2 of the Bureau's Organic Act (15 U.S.C. 272). One of our functions in carrying out that role is to provide expert technical assistance to those involved in the voluntary standards setting process which provides user-defined standards. The development by NBS of petroleum products volume-correction tables (cited in your Attachment No. 1) for the petroleum industry was undertaken in pursuance of that function.

As you know, we also provide technical assistance to the National Conference on Weights and Measures. The determination of whether to institute a legal requirement for temperature compensation in the retail delivery of petroleum products, which may follow consensus based recommendations of the National Conference, is clearly within the authority of the States. Your Attachment No. 3 illustrates this point. There are, of course, many areas in which the National Conference on Weights and Measures seeks consensus as a basis for State regulatory action.

I understand your arguments for Federal Government action which would require temperature compensation in the retail delivery of petroleum products. However, I cannot agree that such action by the Federal Government is authorized in the absence of a Federal statute which specifically calls for temperature compensation.

Sincerely,

Arthur O. McCoubrey

Arthur O. McCoubrey
Associate Director for Measurement Services
National Measurement Laboratory

cc: Secretary Baldrige

ENCLOSURE 2

September 17, 1981

Malcolm Baldrige
Secretary of Commerce
United States Department of Commerce
Washington, D.C. 20230

Dear Mr. Baldrige:

I have received a letter from Arthur O. McCoubrey dated September 3, 1981 in reply to my letter to you dated August 4, 1981.

Therein, Mr. McCoubrey tends to wander from the subject at hand, which is: NBS' failure to provide State and Local weights and measures jurisdictions with a technically correct MEASUREMENT STANDARD for liquid petroleum products!

Mr. McCoubrey notes that such a standard (petroleum products volume-correction tables) have been provided for the PETROLEUM INDUSTRY.

Well, wonderful! Great! Huzzah! - Now do you think it just might be appropriate and opportune for NBS to provide State and Local weights and measures officials with the SAME standard?

This, simply, in order that a nationwide "technical basis for equity in trade" of petroleum products might become possible.

Sincerely,

Charles G. Bockus

cc: Arthur O. McCoubrey

Doug Wakefield

83-040 O—81——18

Scale MANUFACTURERS ASSOCIATION, INC.

1000 Vermont Avenue, N.W., Washington, D.C. 20005 202/628-4634

October 7, 1981

OFFICERS

President
WILLIAM H. PERRY
Cardinal Scale Mfg. Co.

Vice President
PETER R. PERINO
Transducers, Inc.

Executive Director
RAYMOND J. LLOYD

DIRECTORS

FRED H. KATTERHEINRICH
Hobart Corporation

GEORGE N. KRASSNER
StreeterAmet Measurement
Systems Div. Mangood Corp.

HARRY E. LOCKERY
Hottinger Baldwin
Measurements, Inc.

DAVID B. PATTERSON
Toledo Scale Div.
Reliance Electric Co.

PETER R. PERINO
Transducers, Inc.

WILLIAM H. PERRY
Cardinal Scale Mfg. Co.

ROBERT M. ZWEIG
John Chatillon & Sons, Inc.

TECHNICAL DIRECTOR

DARYL E. TONINI

The Honorable Doug Walgren
Chairman
Subcommittee on Science,
Research and Technology
House of Representatives
Washington, DC 20515

Dear Chairman Walgren:

The Scale Manufacturers Association, national trade association for U.S. manufacturers of weighing equipment, remains very interested in proposals to amend the NBS Organic Act, as discussed in your June, 1981, hearings.

We look forward to submitting a position statement on behalf of our member companies in advance of the Subcommittee's further consideration and/or hearings on this matter. Preparation of our position statement is presently underway, and the statement will be submitted in December.

Thank you for the opportunity to present testimony on behalf of SMA at your earlier hearings. We appreciate the Subcommittee's interest and consideration.

Cordially,

William H. Perry

William H. Perry

WHP:ses

cc: Members of the Subcommittee

National Controls, Inc.
A subsidiary of
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2320 Airport Blvd.
P.O. Box 1501
Santa Rosa, Calif. 95402
Tel. 707/527-5555
TWX 510/744-2076

The Honorable Doug Walgren
Chairman
Subcommittee on Science,
Research and Technology
House of Representatives
Washington, DC 20515

Dear Chairman Walgran:

As a member of The Scale Manufactures Association our company is very interested in the proposals to amend the NBS Organic Act.

We know that The Scale Manufacturers Association is in the process of preparing a position statement in advance of your subcommittee's further consideration on this matter.

I would like to thank you and the subcommittee for allowing the SMA to present testimony, and for your interest and consideration of the SMA's position.

Sincerely,

Harlan Hanson
President

HH:jg

cc: Ray Floyd SMA

APPENDIX II

POLICY STATEMENT OF THE SCALE MANUFACTURERS ASSOCIATION, INC.

Scale MANUFACTURERS ASSOCIATION, INC.

1000 Vermont Avenue, N.W., Washington, D.C. 20005 202/628-4634

November 25, 1981

OFFICERS

President
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Cardinal Scale Mfg. Co.

ROBERT M. ZWEIG
John Chatillon & Sons, Inc.

TECHNICAL DIRECTOR

DARYL E. TONINI

The Honorable Doug Walgren
Chairman
Subcommittee on Science, Research and
Technology
U.S. House of Representatives
Room 2319, Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Walgren:

We are pleased to submit herewith the position statement of the Scale Manufacturers Association regarding amendment of the Organic Act for the National Bureau of Standards.

This statement was adopted by unanimous vote of our member companies at our Fall Meeting last week.

We look forward to an opportunity to participate in further hearings of the Subcommittee on this important matter. The interest and consideration of the Subcommittee are appreciated.

Cordially,

William H. Perry

WHP:njn

cc: Members of the Subcommittee

Scale MANUFACTURERS ASSOCIATION, INC.

1000 Vermont Avenue, N.W., Washington, D.C. 20005 202/628-4634

November 17, 1981

SMA POSITION STATEMENT

1. The Scale Manufacturers Association (SMA) recommends that the Organic Act for the National Bureau of Standards (NBS) be amended to mandate, rather than authorize, the Secretary of Commerce, through NBS, to undertake the custody, maintenance, and development of the national standards of measurement, etc., as defined in Section 272 of the Act.

2. SMA recommends that the Organic Act for the NBS be amended to mandate that the functions of the current Directorate of Measurement Services (DMS) be assigned directly to the Office of the Director of NBS.

3. SMA recommends that the Office of Weights and Measures (OWM) budget and personnel levels projected in the DMS five-year plan (1981-1986) be implemented as scheduled, even if this requires reallocation of existing NBS resources.

4. SMA recommends that Section 278 of the NBS Organic Act, Visiting Committee, be amended to provide for a Visiting Committee of nine members to be appointed by the Secretary of Commerce. Of this group of persons prominent in the various areas of responsibility of the Bureau under the Organic Act, it is proposed that three shall be experts in scientific research and its administration, three shall be experienced in the use of standards and measurements, and three shall be knowledgeable of industrial manufacturing or its management. Of the latter, SMA recommends that one be drawn from the scale manufacturing industry.

5. SMA recommends that the U.S. House of Representatives Subcommittee on Science, Research and Technology maintain oversight of NBS budget and personnel levels to insure that the mandate recommended above is carried out.

6. SMA recommends that a master plan incorporating all the essential elements for a U.S. commercial weights and measures control plan be adopted and implemented by all parties concerned, including NBS, the National Conference on Weights and Measures (NCWM), and industry.

RATIONALE FOR SMA POSITION

1. As long as the Organic Act merely authorizes that certain functions be undertaken by the Secretary of Commerce, there is a distinct possibility, if not likelihood, that inadequate resources will be provided for the DMS to insure that the authorized functions listed in Section 272 of the Act are carried out. If these functions were mandated, with appropriate oversight, the functions of the current DMS would be carried out.

2. SMA feels that the current organizational structure of the DMS is adequate for administration of an effective U.S. weights and measures program. However, leaving the OWM, the Office of Domestic and International Measurement Standards (ODIMS), and the Office of Measurement Services (OMS) where they are in this structure would be acceptable only under the umbrella of an Organic Act mandate that would insure a return of OWM to previous levels of performance.
In the opinion of SMA, the best assurance that this would happen would be the assignment of DMS, by legislative mandate, to the Office of the Director of NBS.

3. OWM budget and personnel levels projected in the DMS five-year plan are shown below. SMA feels that these projections must be implemented as scheduled to avoid disappearance of OWM altogether. Appendixes A and B illustrate vividly the decline of OWM to its present level of ineffectiveness.

	1981	1982	1983	1984	1985	1986
Dollars (000's)	758	1,053	1,504	1,721	1,983	2,007
Personnel(1)	11.8	16.8	24.0	27.7	31.9	32.4
Slots	10.5	11.5	16.5	19.5	20.5	21

(1) -- Positions are "full-time equivalent", including work contracted to NBS Centers and contracted to outside organizations.

4. A Visiting Committee which more effectively represents the entire range of interests to be served under a new mandate for DMS/NBS would help insure that this mandate is carried out. SMA feels that past Visiting Committees have failed to

recognize the steady deterioration of DMS and its principal functions, to the point that the needs of the American public are not being met.

5. The U.S. House of Representatives Subcommittee on Science, Research, and Technology has addressed the subject of the NBS Organic Act in public hearings and is positioned properly to provide continuing oversight of NBS budgets and programs.

   Consideration should be given to including the viewpoints of the NBS Visiting Committee, consumer interests, and industry to this oversight.

6. Functional roles should be addressed in a national weights and measures control plan. Proposed assignment of organizations or groups:

Function	Assigned To
National Coordination and Authority	National Conference on Weights and Measures (NCWM) (with strong staff support from OWM)
Equipment Pattern Approval	NBS/OWM overall management
Laboratory: Documentation Evaluation	NBS/OWM
Field tests	State/local jurisdictions
Lab tests	Certified commercial metrology labs
Verification (records and administration)	State/local jurisdictions
Equipment initial verification	State/local jurisdictions
Factory tests	Manufacturers
Field process tests	State/local jurisdictions
Equipment Subsequent Verification	
Field process: equipment tests	Manufacturers (equipment) State/local jurisdictions

The DMS five-year plan lists 10 OWM objectives "in order of importance." SMA endorses the objectives and, in general, the ranking assigned.

SMA's most significant disagreement with the OWM "order of importance" ranking is in two areas -- support of NCWM and International Standards.

International Standards rank ninth in the OWM list. SMA would rank this objective third in the list of 10. It should be noted that although ranked ninth in the OWM list, this objective would be ranked much higher (perhaps first) in an ODIMS priority list. Thus, the DMS priority for International Standards undoubtedly would be higher than shown on the OWM list.

Support of the NCWM is ranked first in the OWM list. SMA would rank this objective fourth in the list of 10, behind Prototype Examination (first), Device Technology (second), and International Standards (third).

ADDITIONAL BACKGROUND

In testimony before the House Subcommittee on Science, Research and Technology in June, 1981, Kenneth F. Hammer, president of Fairbanks Weighing Division, Colt Industries, and spokesman for the Scale Manufacturers Association, expressed the opinion that NBS leadership in the U. S. commercial system of weights and measures has been inadequate to meet the needs of commerce.

He cited the following factors as contributing to this situation:

-- Assertion of consumer viewpoints

-- Rapid advances in technology

-- National dialogue on metric conversion

-- Increasing recourse to the courts

-- Influence of the Fair Packaging and Labeling Act of 1966

--Entrance of the U. S. into the International Organization for Legal Metrology (OIML)

In its testimony, SMA proposed that through amendment of the Organic Act for NBS, the Bureau's leadership role in commercial weights and measures be restored through restructuring within the Bureau.

Barring such restructuring, SMA suggested the alternative of relocating the DMS (with its responsibility for weights and measures leadership) elsewhere in the Department of Commerce or in the Department of Agriculture. It was noted that significant comparable activities have already been relocated by Congressional action.

Subsequent to the Subcommittee's hearings last June, the DMS published its Long Range Plan (1981-1986). The plan confirms two points:

1. Resources and NBS top management attention committed to the U. S. commercial weights and measures system have been seriously neglected for at least the last decade.

2. Unless a change in direction is mandated by Congress, prospects for this situation changing in the next five years appear remote.

Without a Congressionally mandated change, carrying with it the necessary personnel and funding commitments to make it work, SMA believes there is little hope that NBS will restore the U. S. weights and measures system to previous levels of effectiveness.

LONG RANGE PLAN (1981-1986)

The DMS Long Range Plan (1981-1986) is a comprehensive statement of the funding/staffing crisis facing the weights and measures community.

The plan indicates, however, that if adequate resources were available, the DMS has the understanding of both the problem and the specific needs of the commercial weights and measures system to manage the system effectively.

The significant 11-year decline in resources (dollars and people) provided to OWM is illustrated dramatically by charts in the DMS 5-year plan (Appendixes A and B). Even the 1970 base year in the Appendix A chart (with three times the staff and 70% more budget in constant dollars than in 1981) does not represent the high point of OWM's leadership in weights and measures during the past 20 years, according to some observers.

Over the past decade and up to the major cutbacks in the federal budget this year, neither the total U. S. budget nor the total NBS budget experienced the severe reductions made in OWM resources. In current dollars, the total NBS budget increased 156% from 1970 to 1981 while the OWM budget was increased 43%.

In 1970, the OWM budget represented eight-tenths of one percent of the total NBS budget (current dollars). In 1981, the figure is down to four-tenths of one percent.

SMA believes these figures strongly support the view expressed during the Walgren Subcommittee hearings last June that NBS has let the U. S. weights and measures program erode dangerously in its pursuit of more technically and scientifically exciting roles and activities.

Appendix E of the DMS 5-year plan (from which Appendixes A and B of this statement were taken) is an excellent statement of commercial weights and measures trends and issues. The summary of observations made by the National Academy of Sciences (NAS) panel which reviews the OWM program are particularly germane to the concerns expressed during the Walgren Subcommittee hearings.

A member of the NAS panel said, "Increased NBS action is necessary to avoid abandoning this nation to a growing chaos among government jurisdictions at all levels and among all sectors in a scramble to retain or regain measurement integrity in an ever more complicated environment."

The NAS panel is quoted as concluding that, "There is inadequate concern by NBS for the needs of the system of commercial measurement in the country."

Table 5 of the DMS 5-year plan illustrates the consensus which exists among weights and measures constituencies. This table charts the views of seven organizations or persons, including the NAS panel, three witnesses at the Walgren Subcommittee hearings, and three groups which participated in the NBS Measurement Needs Study.

Six of the seven recommended that the OWM's role and function be mandated in the NBS Organic Act. Five recommended that federal preemption be avoided. Four recommended that NBS either support OWM or move it elsewhere. Six recommended that OWM staff and funding be increased.

Of the three separate offices within DMS, two (OWM and ODIMS) have major functional responsibilities in the commercial weighing system. In addressing concerns relating to the historic OWM functions, therefore, it is important that ODIMS be considered an integral part of the whole.

Although it might be assumed that ODIMS would benefit from a mission mandate as an amendment to the NBS Organic Act, there is great concern over the future role of ODIMS, particularly if it were to be moved out of DMS.

The third office within DMS is the Office of Measurement Services (OMS). OMS has a less direct but also essential role to play in commercial weighing as a consequence of the assigned responsibility for managing a program to develop measurement assurance services for the public.

APPENDIX A

TABLE 1

RESOURCES PROVIDED TO THE OFFICE OF WEIGHTS AND MEASURES

Fiscal Year	Funding (Deflated $'s)	Funding (Actual)	Staff
1970	$530,000	$530,000	29 P
1971	$498,000	$524,000	23 P
1972	$441,000	$485,000	15 P
1973	$360,000	$418,300	11 P 2 T
1974	$334,000	$471,800	15 P
1975	$400,550	$548,700	15 P 1 T
1976	$368,500	$550,000	15 P 2 T
1977	$379,520	$593,000	15 P 2 T
1978	$403,149	$660,900	15 P 1 T
1979	$370,944	$662,400	13 P 1 T
1980	$326,600	$710,100	11 P 1 PT
1981	$310,985	$758,500	10 P 1 PT

From: DMS/NBS Long Range Plan (1981-1986)

APPENDIX B

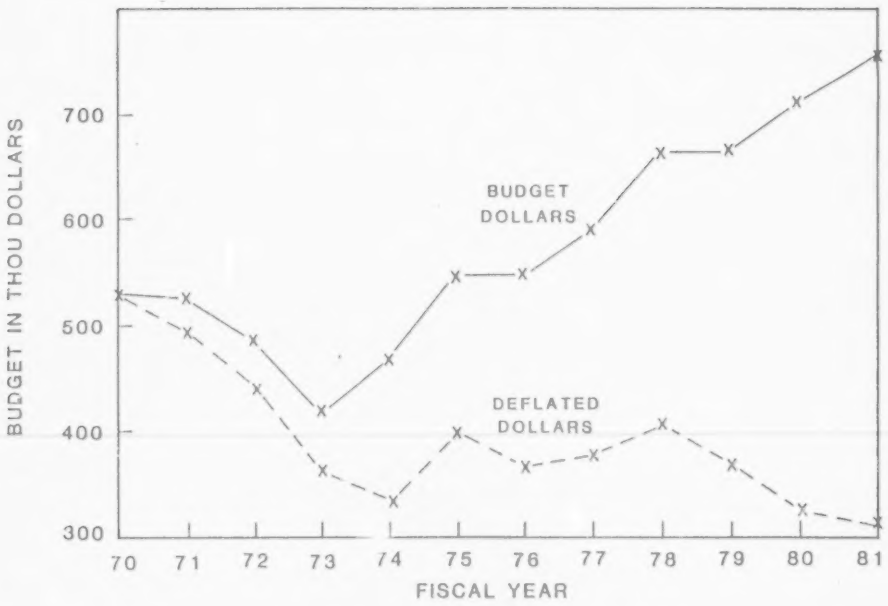

CHART 1 OWM PROGRAM FUNDING

From: DMS/NBS Long Range Plan (1981-1986)